FY 2016 Annual Report on Cost Assessment Activities

January 2017

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Director, Cost Assessment and Program Evaluation

January 2017

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FOREWORD

President Obama signed the Weapon Systems Acquisition Reform Act (WSARA) of 2009, Public Law 111-23, into law to reform the defense acquisition processes and to bring cost growth under control. To accomplish this, WSARA established the position of Director of Cost Assessment and Program Evaluation (CAPE) in the Office of the Secretary of Defense (OSD). The Director is responsible for ensuring the Department's cost estimation and cost analysis processes provide accurate information and realistic estimates of cost for the major acquisition programs. Since the enactment of this landmark legislation, CAPE has worked with the military department cost agencies and other organizations throughout the Department of Defense (DoD) cost community to strengthen cost estimation, ultimately reducing risk in acquisition programs.

As this eighth edition of this Annual Report is being published, I am concluding two and one half years of serving as the Director of CAPE. During this time, and during the time of my predecessor, CAPE has completed more than 125 reports, including independent cost estimates for major weapons systems, estimates to support restructuring of programs and certifications following Nunn-McCurdy breaches, multi-year procurement contract savings certifications, and MAIS critical change reports. The DoD cost community writ large has made substantial progress since WSARA. There have been fewer acquisition program cost and schedule breaches, reduced cost growth, improved quality of the cost estimates made by CAPE and the military departments, increased emphasis on cost data reporting resulting in improved data quality and compliance with established standards, and a better educated and trained cost analysis work force.
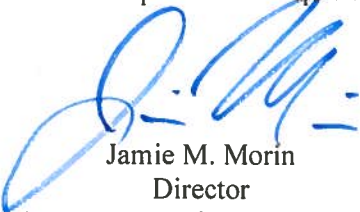
The DoD cost community is working together to achieve the objectives of WSARA. We have established a solid and unified working relationship among the leaders of CAPE, the military department cost agencies, and the field-level cost organizations, with CAPE serving as the advocate for the DoD cost community as a whole. We have established formal strategic direction for the entire cost community, as stated in written policy and procedures. We have invested in the Cost Assessment Data Enterprise project, which is beginning to revolutionize cost data collection and analysis by providing the entire DoD cost community with a centralized and authoritative database supported by advanced data visualization and other analytic tools. Moreover, we have made great strides in enhancing the underlying data that supports this project. We have restored rigorous and systematic cost data collection, which is essential to support accurate cost estimates of current and future programs. We have also worked with the Defense Acquisition University and other educational institutions to conduct a comprehensive review of the entire curricula and course content provided to the DoD cost community in order to ensure that desired core competencies for cost analysis are being addressed.

Although the DoD cost community has made significant progress, many challenges remain, and there is more work to be done. The guiding vision for this work is the need for independent, rigorous, and objective program cost and schedule estimates, paired with thorough risk assessments, based on solid data and analytic methods and tools. The Congress has with good reason continued to reaffirm the importance of this role in legislation since WSARA, because such estimates are essential for effective acquisition decision making and oversight. Good

estimates, and real discipline in funding programs to those estimates, gives the Services and their acquisition program managers the best possible chance of delivering the capabilities that future service members will need to deter conflict and, when necessary, win the nation's wars.

To achieve this vision, the future leaders of CAPE and other DoD cost organizations will need to continue to provide strategic direction through formal policy and procedures that codify this direction and respond to continuing new and demanding requirements from the Administration and the Congress. It will also be essential to make continuing investments in cost community personnel and their training and education, as well as advanced methods, tools, and data that support the mission in DoD.

As the Department's lead program evaluators as well as cost estimators, CAPE supports the Secretary of Defense's decision making on the allocation of resources during the annual Program and Budget Review process. Many of the shifts in resources made in each year's Future Years Defense Program are made by integrating the analysis produced by the two sides of CAPE. This provides the Director of CAPE with a unique perspective on the perennial challenge of balancing the Department's resource portfolio to produce an efficient and effective national defense. While enormous progress has been made, meeting the Department's mission and keeping faith with both those who serve and the taxpayers who pay for our national defense will require sustained focus on delivering better outcomes across the Department's acquisition portfolio.

Jamie M. Morin
Director
Cost Assessment and Program Evaluation

CHAPTER I – INTRODUCTION

As established by WSARA, the Director of CAPE is the principal official for independent cost estimation and cost analysis, ensuring that the cost estimation and cost analysis processes of DoD provide accurate information and realistic estimates of cost for the acquisition programs of the Department.

In fulfilling this responsibility, the Director of CAPE conducts independent cost estimates and cost analyses; prescribes policies and procedures for the conduct of cost estimation and cost analyses in the DoD; reviews all cost estimates and cost analyses conducted in connection with Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) programs; conducts cost analyses of defense acquisition programs to be carried out using multiyear contract authority; prescribes policies and procedures for the reporting and collection of actual cost data and other information for MDAPs and MAIS programs; provides leadership in the education and training of the DoD and the broader US Government cost analysis communities; and issues guidance relating to the full consideration of life-cycle management and sustainability costs in MDAPs and MAIS programs.

This annual report describes this year's progress in reaching these ambitious objectives. The organization of this report is as follows:

- Chapter II provides an overview of cost analysis in the DoD. It describes the types and purposes of cost analysis organizations throughout the Department and explains the procedures for preparing cost estimates that support the defense acquisition process. It also introduces the main DoD systems that collect actual data and information on the contract and government costs of programs. Some of the key points in this chapter are:
  - o **DoD Cost Organizations.** Cost organizations are embedded throughout the Department: at OSD, at the headquarters of the military departments and defense agencies, and at a wide range of field-level organizations. Each cost organization serves a unique role, but also contributes to the collective efforts of the cost community as a whole.
  - o **Procedures for Cost Assessments.** CAPE has completed six major documents that provide guidance to DoD organizations concerning cost assessment policy and procedures. These documents are:
    - ➢ DoD Directive 5105.84, *Director of Cost Assessment and Program Evaluation (DCAPE)*
    - ➢ DoD Instruction 5000.73, *Cost Analysis Guidance and Procedures*
    - ➢ *Operating and Support Cost-Estimating Guide*
    - ➢ DoD 5000.04-M-1, *Cost and Software Data Reporting (CSDR) Manual*
    - ➢ DoD Instruction 7041.04, *Estimating the Full Costs of Civilian and Active Duty Manpower and Contract Support*
    - ➢ DoD Instruction 7041.3, *Economic Analysis for Decision-making*

The first four of these documents are the primary vehicles for implementing the cost assessment provisions of WSARA throughout DoD. The CAPE efforts to publish procedures for all cost assessment activities are now for the most part complete, and all six of these documents are now in compliance with the OSD standard to be reviewed annually or updated within a ten year period. However, as discussed later in this report, some of these documents will need to be updated due to recent legislation.

- Chapter III reviews the Department's Fiscal Year (FY) 2016 cost estimation and cost analysis activities associated with MDAPs and MAIS programs. These activities include independent cost estimates (ICEs) as well as reviews of military department and defense agency cost estimates. These activities inform the DoD decision authorities at milestone reviews and at other acquisition decision points. This chapter also summarizes the degree to which DoD cost estimation and assessment activities in FY 2016 complied with established procedures, and discusses the overall quality and any consistent differences in methodology among the cost estimates. Some of the notable highlights in this chapter are:

  o **MDAP/MAIS Cost Assessment Activities**. In FY 2016, there were cost assessment activities supporting 12 MDAP milestone reviews, 3 multi-year procurements, 1 critical unit cost (Nunn-McCurdy) breach, and 2 MAIS critical change events. In addition, CAPE completed an update to its estimate of the operating and support (O&S) costs of the F-35 fighter aircraft.

  o **Assessment of Compliance, Quality, and Differences in Methodology**. The cost assessment activities complied with the requirements of WSARA and the established procedures described in Chapter II. The overall quality of the cost estimates prepared by the military departments has continued to improve due to increased rigor. The quality of the cost estimates for both CAPE and the military departments has also continued to improve to better data. A recent CAPE analysis made a comparison between the CAPE ICEs and the service cost positions, and found that the difference between the two estimates since the enactment of WSARA in 2009 has narrowed significantly relative to the prior period between 1999 and the enactment of WSARA. This is a direct result of improvements to the systematic collection of actual cost information over time and improved availability to all parties in the cost community in the Cost Assessment Data Enterprise system discussed later in this report.

  o **DoD Contract Pricing and Cost Estimating Conference.** This year, CAPE worked with the cost and price analysts in contracting community to jointly sponsor a three-day conference at a low-cost facility that allowed approximately 600 cost estimators and contract pricing analysts to educate each other on respective missions, products, and processes. This provided a venue for collaboration on data sharing and analytic methods for mutual benefit.

- Chapter IV describes the status of several ongoing initiatives that will ensure the cost assessment and cost estimating functions for the Department will be improved and modernized as required to meet the evolving needs of the Department. These initiatives address a wide range of issues and concerns, including leadership for the cost community as a whole, cost estimating policies

and procedures, cost tools and data systems, and education and training opportunities for the DoD cost community. Some of the notable highlights in this chapter are:

- o **Cost Leadership Forum.** CAPE has established a periodic meeting with the leaders and senior staff of the military department cost agencies to discuss issues of common interest to the community. The intent is to establish greater collaboration among CAPE and the military department cost organizations by sharing analytic best practices and developing a collective vision of the path forward for the cost community over the next five years in meeting WSARA objectives, improving cost analysis, and dealing with the challenges of the current constrained resource environment.

- o **Policies and Procedures.** Efforts are ongoing to make further additions and improvements to the overall cost estimating guidance. It will also be necessary to update the guidance in FY 2017 for recent legislative changes (made in the National Defense Authorization Act for FY 2017) and other fact-of-life changes, as well as make desired improvements. There will also be an update to the procedures concerning cost data collection, which will implement various initiatives described below.

- o **Enhanced Cost Data Collection**. Over the past few years, CAPE has made considerable progress in restoring systematic data collection. However, based on feedback from government users about desired report enhancements for the data being collected, as well as noted gaps in coverage about important cost data not being collected, CAPE and the military department cost agencies have established several initiatives to improve the quality for data collection and reporting and to increase efficiency through better business processes and use of advancements in information systems technology. One of these initiatives has modernized cost data reporting by enabling the automated submission of low-level cost data directly from the contractors' accounting systems. Other initiatives have led to improved software data reporting and the collection of system technical data (design and performance parameters) that will be useful to cost analysts. In addition, CAPE has continued to improve and expand cost data reporting on major weapon system sustainment contracts. Cost data collection and reporting is also now being extended to certain contract types, where quantities of supplies or levels of service are not specified up front, that have been used to support high-dollar value modernization and sustainment of important weapon system platforms. Cost data collection and reporting is also being extended to government-performed efforts as modern financial systems are implemented throughout the government.

- o **Cost Assessment Data Enterprise**. CAPE initiated the development of the Cost Assessment Data Enterprise (CADE)—the Department's unified initiative to collect, organize, and use data more efficiently. CAPE is partnering with the military department cost agencies and the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) staff to incrementally work towards its CADE vision of the government cost analyst's centralized database and virtual library, housing seamless integrated authoritative data sources that are easily searchable and retrievable. The goal is to reduce time spent on *ad hoc* data collection and validation, allowing more time for actual analysis at a much deeper level, and providing a quicker ability to see how a program is performing between major reviews. This initiative will increase analyst efficiency and will

provide a way for analysts to build upon each other's work, where historically analysts have typically engaged in separate efforts.

- o **Cost Indices**. The cost community now considers the use of both inflation and price escalation indices in cost estimates to be a best practice. To institutionalize this practice throughout the Department, CAPE published *Inflation and Escalation Best Practices for Cost Analysis* in April 2016. This publication is available on the CAPE web site.

- o **Cost Analysis Education and Training**. CAPE and the military department cost agencies formed an Education and Training Working Group that periodically reports its status to the Cost Leadership Forum. This working group developed a framework of desired core competencies—for apprentice, mid-level, and senior cost analysts—that are being used to guide education and training standards for course content. The working group has also worked with the Defense Acquisition University (DAU) to review course content and ensure that these desired core competencies are being addressed. Education and training supported by an advanced training system specific to CADE and its supporting cost data has been developed for incorporation into the curricula at DAU and other educational institutions. CAPE has also worked with DAU on the development of a five-day course pertaining to software cost estimating.

The report also includes appendices that provide background information relevant to cost assessment activities. Appendix A enumerates the cost analysis organizations in the Department. Appendix B describes MDAP unit cost reporting and unit cost breach thresholds. Appendix C describes MAIS reporting and criteria associated with program deviations that trigger notifications or certifications to the Congress. Appendix D provides additional information on DoD cost data collection systems.

CHAPTER II – OVERVIEW OF COST ANALYSIS IN DOD

This chapter provides an overview of the current organizations, policies, procedures, and supporting data systems for cost estimation and analysis in place throughout DoD. Chapter IV of this report describes the efforts to continue to strengthen these institutions to meet the evolving needs of the Department.

This report assumes a modest familiarity with the defense acquisition process on the part of the reader. Readers in need of an introduction to the defense acquisition process are encouraged to refer to the *Defense Acquisition Guidebook* (https://dag.dau.mil).

Overview of Cost Analysis Organizations in DoD

Cost organizations are integrated throughout DoD: at OSD, at the headquarters of the Components (i.e., military departments and defense agencies), and across the DoD field organizations. Each cost group serves unique programmatic and systematic functions but also compliments the family of cost organizations supporting the defense acquisition process and the broad and diverse operations of the Department. This helps foster best practices within the cost community.

At the OSD level, the Director, CAPE is the principal official for independent cost estimation and cost analysis, responsible for ensuring that the cost estimation and cost analysis processes of DoD provide accurate information and realistic estimates of cost for the major acquisition programs of the Department. The Director, CAPE provides ICEs for both MDAPs and MAIS programs when the Milestone Decision Authority (MDA) for a program is the USD(AT&L), under the specific circumstances explained later in this chapter. The Director, CAPE also provides policy for and oversight of preparation and review of DoD Component cost estimates for MDAPs and MAIS programs under other circumstances.

Each military department headquarters has its own cost agency. These cost estimating agencies provide ICEs when acquisition oversight is delegated to the Component and the MDA is the Component Head or Component Acquisition Executive. Also, the military department cost agencies provide policy guidance and provide specialized cost analyses unique to each of the military departments. The military department cost agencies reside in the financial management organizations of their military departments, and are outside their military department's acquisition chain of command.

There are also many field-level cost organizations. These organizations provide resources to support higher headquarters cost estimates and analyses, and they also provide assistance to support day-to-day operations of program offices and similar entities. Examples of such activities include evaluation of contractor proposals and should-cost analyses; support to competitive source selections; cost estimates in support of the programming and budgeting processes; and cost estimates used in specific analytic studies, such as systems engineering design trades or Analysis of Alternatives (AoAs). Field-level and program office members of the cost community workforce often possess important specialized cost and technical experience unique to specific system types or commodity groups, such as satellites, submarines, or tactical missiles.

Appendix A provides a brief description of the military department cost agencies and field-level cost organizations.

Procedures for Cost Assessments at Milestone Reviews and Other Events

This section provides a description of DoD cost assessment procedures for MDAPs and MAIS programs; these procedures were added or modified to meet WSARA requirements.

DoD Directive 5105.84, *Director of Cost Assessment and Program Evaluation (DCAPE)*, was approved on May 11, 2012 and serves as the CAPE charter. The Directive defines overall CAPE roles, responsibilities and authorities in the PPBE, acquisition, and requirements processes. Regarding cost assessment, the Directive establishes the Director CAPE as the principal official for independent cost estimation and cost analysis for the acquisition programs of DoD.

The framework for DoD policy and procedures for cost assessment activities is provided in Enclosure 10 ("Cost Estimating and Reporting") contained in DoD Instruction 5000.02, *Operation of the Defense Acquisition System*. DoD Instruction 5000.02 was issued by USD(AT&L) in January 2015.

More specific guidance on prescribed policy and procedures is provided in DoD Instruction 5000.73, *Cost Analysis Guidance and Procedures*. This instruction was issued by the Director, CAPE in June 2015. The instruction is the primary vehicle for implementing the cost assessment provisions of WSARA throughout DoD. In particular, it provides guidance to the military departments and defense agencies concerning the preparation, presentation, and documentation of life-cycle cost estimates for major acquisition programs. It assigns roles and responsibilities, and describes the process and timelines for the cost assessment activities that support the various program decision points discussed later in this chapter.

All of these directives and instructions are available on the DoD website http://www.dtic.mil/whs/directives/index.html.

Cost Assessment Procedures for Major Defense Acquisition Programs

Pursuant to statutory requirements (section 2334 of title 10, United States Code), CAPE prepares ICEs and conducts cost analysis for MDAPs for which the MDA is USD(AT&L):

- In advance of any Milestone A certification or Milestone B certification under sections 2366a/b of title 10, United States Code.
- In advance of any decision to enter low-rate initial production (LRIP) or full-rate production (FRP).
- Any certification for critical unit cost (Nunn-McCurdy) breaches under section 2433a of title 10, United States Code. Appendix B provides a description of the procedures for MDAP unit cost reporting and the criteria for a critical unit cost breach.
- At any other time considered appropriate by the DCAPE or upon the request of USD(AT&L) or other senior leaders of the Department.

For milestone and other acquisition reviews, when the MDA is delegated to the Component, CAPE either (1) reviews the ICE prepared by the military department cost agency (or defense agency equivalent), and provides a written summary of its review and findings to the MDA, or (2) prepares the ICE when considered appropriate by the Director, CAPE or upon the request of USD(AT&L) or the MDA.

Currently, for the 109 MDAPs, USD(AT&L) is the MDA for 46 programs, and the various Component Acquisition Executives are the MDAs for the remaining 63 programs.

Any changes to these statutory requirements made by the National Defense Authorization Act for FY 2017 (enacted on December 23, 2016) will be incorporated into CAPE policy and procedures in FY 2017.

Cost Assessment Procedures for Major Automated Information Systems

As required by section 2334 of title 10, United States Code, CAPE prepares ICEs and conducts cost analysis for MAIS programs for which the MDA is USD(AT&L):

- In advance of any certification following a critical change under section 2445c(f) of title 10, United States Code. Appendix C provides a description of the procedures for MAIS program reporting and the criteria for a critical change.
- At any other time considered appropriate by the DCAPE or upon the request of USD(AT&L) or other senior leaders of the Department.

For milestone and other acquisition reviews, when the MDA is delegated to the Component, CAPE normally reviews the ICE prepared by the military department cost agency, and provides a written summary of its review and findings to the MDA. However, CAPE may prepare the ICE for a delegated program when considered appropriate by the Director, CAPE or upon the request of USD(AT&L) or the MDA.

Currently, for the 34 MAIS programs, USD(AT&L) is the MDA for 19 programs, and the various Component Acquisition Executives are the MDAs for the remaining 15 programs.

Note that the statutory provisions pertaining to MAIS programs, including the critical change procedures, are being removed from statute effective September 30, 2017. This change was made by the National Defense Authorization Act for FY 2017.

Role of the Independent Cost Estimate

Both MDAPs and MAIS programs are supported by ICEs at milestone and other program reviews. An ICE for a program in practice is conducted by using a combination of historical precedence, results of extensive site visits, and the actual performance of that program to date. It is a careful and comprehensive analysis that looks at all aspects of a program, including risks.

At a minimal level, the purpose of the ICE is to allow decision makers to ensure that (1) current program cost estimates are reasonable, (2) initial program baselines established for cost and schedule are realistic and achievable, (3) subsequent program baselines remain realistic, and (4) sufficient funding is available in the Future Years Defense Program (FYDP) to execute the program. However, CAPE experience is that the ICE should also support much broader program decisions. The ICE can provide decision makers with insights concerning:

- Unique challenges of each program, and options available to address them;
- Balanced requirements based on trade-offs among cost, capabilities, and schedule;
- Alternative acquisition strategies to improve upon ways to do business and avoid risk-prone models; and
- Options to effect better program outcomes along the way as circumstances change or unexpected events occur.

In short, the ICE adds value by being able to tell the program's story and provide decision makers with a wide range of information necessary to make fully informed acquisition decisions.

Component Cost Position and Full Funding Commitment

One important element of current CAPE policy for major acquisition programs requires the Component to establish a formal position on the estimated cost of the program and furthermore to commit to fully fund the program in the FYDP consistent with the Component's cost position. The Component establishes a documented Component Cost Position for all MDAPs and MAIS programs prior to the Milestone A, B, and C reviews and the Full-Rate Production Decision (for an MDAP) or Full Deployment Decision Review (for a MAIS program). The Component Cost Position is signed by the appropriate military department's Deputy Assistant Secretary for Cost and Economics (or defense agency equivalent). Each Component has its own process to arrive at the Component Cost Position. In many cases, the Component establishes its cost position by performing a Component-wide corporate-level review, led by the military department cost agency (or defense agency equivalent), after consideration of a program office cost estimate and an assessment of that estimate by the military department cost agency.

At each milestone or other review, the Component must fully fund the program to the Component Cost Position in the current FYDP, or commit to full funding of the cost position in the next FYDP. The Component Acquisition Executive and the Component Chief Financial Officer endorse and certify in a Full Funding Certification Memorandum that the FYDP fully funds (or will fully fund) the program consistent with the Component Cost Position. This Certification Memorandum must be submitted prior to the Defense Acquisition Board (DAB) review.

Multi-Year Procurement

Public law (section 2306b of title 10, United States Code) establishes several criteria that must be satisfied and certified by the Secretary of Defense prior to the award of a multi-year contract in an amount equal to or greater than $500 million for a defense acquisition program. Some of these criteria (concerning substantial savings, realistic cost estimates, and availability of funding) must be supported by a CAPE cost analysis of the proposed multi-year procurement (MYP) strategy and contract structure, which includes a comparison of the estimated costs of multi-year versus annual contract awards.

For each MYP candidate, CAPE provides a preliminary cost analysis of the potential cost savings that could be obtained through a multi-year procurement contract compared to a baseline of annual procurement contracts. This analysis is used to support a DoD decision to seek a multi-year request, for a specific authorization by law to carry out the multi-year procurement strategy. Following Congressional approval (in the National Defense Authorization Act) for the use of the MYP strategy, the Component and the contractor negotiate and definitize the MYP contract terms. At this point, CAPE updates its previous cost analysis to incorporate the most recent cost information, including actual cost data and experience to date as well as an evaluation of cost realism in the contractor's proposal. The updated cost analysis is provided in time to support a DoD notification to the congressional defense committees of the intent to award the multi-year contract. This notification, by law, must be provided at least 30 days before the contract award.

Confidence Levels in Cost Estimates

Section 2334 of title 10, United States Code requires that cost estimates adopt a confidence level that provides a high degree of confidence that the program can be completed without the need for significant adjustment to program budgets. In general, CAPE satisfies this requirement by ensuring that all of its cost estimates are built on a product-oriented Work Breakdown Structure (WBS), based on historical actual cost information whenever possible, and most importantly, based on conservative assumptions that are consistent with actual demonstrated contractor and government performance for a series of acquisition programs in which the Department has been successful.

These requirements were removed by the National Defense Authorization Act for FY 2017. In the future, cost estimates will now provide a discussion or program risks, and the potential impacts of risks on program costs.

Cost Estimates for Contract Negotiations

Section 2334 of title 10, United States Code requires that for MDAPs and MAIS programs, cost estimates developed for baselines and other program purposes are not to be used for the purpose of contract negotiations or obligation of funds. Section 2334 also states that cost analyses and targets developed for the purpose of contract negotiations shall be based on the government's reasonable expectation of successful contractor performance in accordance with the contractor's proposal and previous experience.

The procedures to implement these statutory requirements were developed as part of the Department's "Should Cost" initiative, which is intended to proactively target cost reduction and drive productivity improvement into major acquisition programs. These procedures are contained in DoD Instruction 5000.02, *Operation of the Defense Acquisition System.* In this instruction, for MDAPs and MAIS programs, it is DoD policy to budget to the CAPE ICE unless an alternative estimate is specifically approved by the MDA. However, program managers are required to develop a "should cost" estimate as a management tool to control and reduce cost. The intention is that neither the ICE nor the Component Cost Position should be allowed to become a self-fulfilling prophecy. The "Should Cost" initiative challenges managers to identify and achieve savings below budgeted most-likely costs. "Should Cost" analyses can be used during contract negotiations (particularly for sole source procurements) and throughout program execution, including sustainment. Further information on the "Should Cost" initiative is provided in the *Defense Acquisition Guidebook,* section 10.15.2 ("Should-Cost").

In addition, electronic data warehouses of contractor cost data reports have been used to provide insight and support multiple studies throughout the DoD cost and acquisition communities concerning contract profits and fees for both prime contractors and major subcontractors. Acquisition professionals can review this information in order to assess the extent that realized profits and fees for completed acquisition programs have been compatible with current guidelines contained in defense policy and regulations, and use that information in negotiations concerning ongoing acquisition programs.

Cost Analysis Requirements Description

CAPE requires and provides guidance on the technical content and use of a document known as the Cost Analysis Requirements Description (CARD). The CARD provides a complete, detailed description of the major acquisition program that supports preparation of the Component Cost Position, the ICE, and other

cost estimates, as required. The CARD succinctly describes the key technical, programmatic, and operational characteristics of an acquisition program. The foundation of a sound and credible cost estimate is a well-defined program, and the CARD is used to provide that foundation. The CARD, along with supporting data sources, provides all of the information necessary to develop a cost estimate.

CAPE guidance concerning the CARD was issued in a policy memorandum in June 2015. This memorandum is available on a Defense Acquisition University website (https://acc.dau.mil/CommunityBrowser.aspx?id=723238). More recent guidance was provided in the CAPE memorandum, *DoD Cost Analysis Data Improvement*, issued on January 9, 2017.

Recent changes to improve and streamline the CARD are described in Chapter IV.

Operating and Support Cost Estimates

Section 2334 of title 10, United States Code requires that the Director, CAPE issue guidance relating to full consideration of life-cycle management and sustainability costs in major defense acquisition programs and major automated information system programs. To meet this requirement, CAPE issued the *Operating and Support Cost-Estimating Guide* in March 2014. This guide explains and illustrates how O&S cost estimates and analyses can support key program decisions throughout the life cycle. The guide also provides a tutorial on the best practices for preparing, presenting, and documenting O&S cost estimates. The guide is available on the CAPE website at http://www.cape.osd.mil/files/OS_Guide_v9_March_2014.pdf.

Guidance and Procedures for Other Cost Assessment Activities

This section provides a description of certain DoD cost assessment procedures, other than cost estimates for MDAPs and MAIS programs.

Cost Comparisons of Military, Civilian, and Contractor Manpower

CAPE issued DoD Instruction 7041.04, *Estimating and Comparing the Full Costs of Civilian and Active Duty Military Manpower and Contract Support,* in July 2013. This instruction establishes policy and provides procedures to estimate and compare the full costs of active duty military, DoD civilians, and contract support. The business rules, potential cost factors, and data sources provided in this instruction are used in cost-benefit analyses or business case analyses in support of workforce mix decisions. This instruction is available on the DoD website http://www.dtic.mil/whs/directives/index.html.

To support the DoD community in performing the numerous calculations required by this instruction, CAPE has made available a web-enabled tool for estimating the Full Cost of Manpower (FCoM), which will automatically calculate all cost elements required to maintain consistency with guidance in the instruction. The FCoM tool is available on the CAPE website (www.cape.osd.mil) and is usable by all personnel who possess a valid Common Access Card (CAC). A classified version of the tool is available on the DoD Secure Internet Protocol Router Network (SIPRNet). The tool has been used to compare the costs of military and civilian intelligence personnel, as well as to compare military and civilian manpower costs for the development and expansion of the cyber workforce. The tool will also be incorporated into CADE.

Economic Analysis for Decision-making

CAPE issued DoD Instruction 7041.3, *Economic Analysis for Decision-making,* in September 2015. This instruction is the DoD implementation of Office of Management and Budget (OMB) Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*. The instruction prescribes the application of economic analysis concepts to the evaluation of costs and benefits of investment alternatives. This instruction is available on the DoD website http://www.dtic.mil/whs/directives/index.html.

DoD Cost Data Collection Systems

As noted earlier, CAPE is responsible for prescribing policy and procedures for the reporting and collection of actual cost data that is used throughout the cost community. Systematic and institutionalized cost data collection and validation is critical to the preparation and support of credible cost estimates. DoD has three primary collection systems for cost data. The Cost and Software Data Reporting (CSDR) system serves as the primary source of cost data for major contracts and subcontracts associated with MDAPs and MAIS programs. The Earned Value Management (EVM) Central Repository is used to collect and archive EVM reporting documents (such as Integrated Program Management Reports). The three Visibility and Management of Operating and Support Costs (VAMOSC) systems (one system for each military department) collect historical O&S costs for major fielded weapon systems.

Chapter IV discusses current CAPE efforts to improve the CSDR and VAMOSC systems, and Appendix D provides additional details concerning all of the cost data collection systems. Chapter IV also provides discussion on the treatment of inflation and price escalation in adjusting cost data for use in estimates.

Summary

This chapter reviewed the cost assessment organizations, policies and procedures, and data collection systems in DoD. These provide the foundation on which the Department is building as it continues to strengthen its cost assessment institutions. Ongoing efforts toward that end are described in Chapter IV of this report.

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CHAPTER III – DOD COST ASSESSMENT ACTIVITIES IN FY 2016

This chapter provides a summary of the DoD cost estimates and cost analyses that were made in FY 2016 in support of MDAP milestone and other acquisition reviews, multi-year procurement, MDAP critical unit cost breaches, and MAIS critical changes. There are also some observations regarding compliance with policy and procedures, quality of the cost estimates over time, and differences between the CAPE and Component cost estimates.

MDAP Milestone or Other Review Cost Assessment Activities

Table 1 provides a summary of the cost assessment activities in FY 2016 that supported milestone or other reviews. For each MDAP with a milestone review or other event, Table 1 identifies the program name and acronym, the responsible Component, the supporting cost estimate(s) or analyses presented to the MDA, and the review event being supported. There were 12 MDAP milestone reviews or other events supported by cost assessment activities in FY 2016 (excluding any cost assessment activities associated with classified programs).

Table 1. MDAP Milestone or Other Review Cost Assessment Activities in FY 2016

Program Name	Acronym	Component	Program Type	Cost Assessment Activity	Activity Date	Supported Event	Event Date
B-2 Defensive Management System - Modernization	B-2 DMS-M	Air Force	Acquisition Category (ACAT) ID	CAPE Independent Cost Estimate Air Force Cost Position	3-Nov-15 2-Oct-15	Milestone B	24-Mar-16
Amphibious Combat Vehicle Phase 1 Increment 1	ACV 1.1	Navy	ACAT ID	CAPE Independent Cost Estimate Navy Cost Position	17-Nov-15 8-Oct-15	Milestone B	19-Nov-15
Joint Surveillance Target Aircraft Radar System Recapitalization	JSTARS Recap	Air Force	ACAT ID	CAPE Independent Cost Estimate Air Force Cost Position	9-Dec-15 18-Nov-15	Milestone A	10-Dec-15
Next Generation Jammer Increment 1	NGJ Inc 1	Navy	ACAT ID	CAPE Independent Cost Estimate Navy Program Office Estimate	10-Mar-16 4-Mar-14	Milestone B	5-Apr-16
Improved Engine Turbine Program	ITEP	Army	ACAT IC	CAPE Concurrence CAPE Review Army Cost Position Army Independent Cost Estimate	7-Jul-16 29-Jun-16 8-Jun-16 10-Jun-16	Milestone A	22-Aug-16

Table 1. MDAP Milestone or Other Review Cost Assessment Activities in FY 2016 (cont.)

Program Name	Acronym	Component	Program Type	Cost Assessment Activity	Activity Date	Supported Event	Event Date
Joint Precision Approach and Landing System	JPALS	Navy	ACAT IC	CAPE Concurrence	1-Jul-16	Milestone B (restoration)	27-Jun-16
				CAPE Review	29-Jun-16		
				Navy Cost Position	6-May-16		
				Navy Independent Cost Estimate	3-May-16		
KC-46 Tanker Modernization	KC-46A	Air Force	ACAT ID	CAPE Independent Cost Estimate	10-Aug-16	Milestone C	12-Aug-16
				Air Force Cost Position	29-Jul-16		
Ground Based Strategic Deterrent	GBSD	Air Force	pre-MDAP	CAPE Independent Cost Estimate	19-Aug-16	Milestone A	23-Aug-16
				Air Force Cost Position	2-Feb-16		
MQ-4C Triton Unmanned Aircraft System	MQ-4C	Navy	ACAT ID	CAPE Independent Cost Estimate	19-Aug-16	Milestone C	22-Sep-16
				Navy Cost Position	3-Aug-16		
Presidential Aircraft Recapitalization	PAR	Air Force	ACAT ID	CAPE Independent Cost Estimate	16-Jul-15	Milestone B	9-Sep-16
				Air Force Cost Position	25-Jun-15		
Mid-Tier Networking Vehicular Radio	MNVR	Army	ACAT ID	CAPE Independent Cost Estimate	20-Sep-16	Milestone C	3-Oct-16
				Army Cost Position	18-Jul-16		

Table 1. MDAP Milestone or Other Review Cost Assessment Activities in FY 2016 (cont.)

Program Name	Acronym	Component	Program Type	Cost Assessment Activity	Activity Date	Supported Event	Event Date
F-15 Eagle Passive Active Warning Survivability System	F-15 EPAWSS	Air Force	ACAT IC	CAPE Concurrence	30-Sep-16	Milestone B	2-Nov-16
				CAPE Review	26-Sep-16		
				Air Force Cost Position	21-Sep-16		
				Air Force Independent Cost Estimate	21-Sep-16		

Remarks about Specific Programs

- The Next Generation Jammer Increment 1 is a pilot program following the so-called "skunkworks" streamlined acquisition process (the term skunkworks refers to the Lockheed Advanced Development Projects organization that developed the U-2 and SR-71 reconnaissance aircraft and the F-117 stealth fighter). As part of this process, the Navy was allowed to prepare a program office cost estimate in lieu of a formal cost position.
- In FY 2016, there were three milestone reviews of ACAT IC programs (where the milestone decision authority was delegated to the military department). In each case, CAPE reviewed and concurred with the military department cost position.
- The Joint Precision Approach and Landing System originally had Milestone B approval in 2008, but that approval was rescinded in 2014 due to a critical Nunn-McCurdy unit cost breach. Milestone B for the restructured program was restored by USD(AT&L) in June 2016.
- Additional remarks about the Multi-Tier Networking Vehicular Radio and Ground Based Strategic Deterrent programs are provided later in this chapter.
- In addition to the programs displayed in Table 1, an Air Force Cost Position and CAPE ICE were prepared in support of the B-21 bomber EMD contract award in October 2015. However, further details are classified.

CAPE Cost Analysis for Multi-Year Procurement

As noted in Chapter II, CAPE prepares a preliminary ICE for a proposed MYP strategy and contract structure to support the Department's certification to the Congress of significant savings and other criteria, and updates the ICE (after MYP approval from the Congress) prior to the award of a multi-year contract. In FY 2016, CAPE completed three analyses supporting multi-year procurement. In two cases (the AH-64E Apache and the UH-60M/HH-60M Black Hawk variants), CAPE completed preliminary estimates of savings to support the DoD MYP proposal contained in the FY 2017 President's Budget. Approval for these two cases was provided by the Congress in the National Defense Authorization Act for FY 2017. In the third case (the C-130J Super Hercules), CAPE completed an updated estimate of MYP savings in November 2015 prior to the contract award in December 2015.

DoD Critical Unit Cost (Nunn-McCurdy) Breaches in FY 2016

There was one cost assessment activity supporting a certification decision associated with a critical unit cost (Nunn-McCurdy) breach in FY 2016. Table 2 identifies the program name and acronym, the responsible Component, the supporting cost estimate(s) or analyses presented to the USD(AT&L), and the date of the critical breach certification. Descriptions of unit cost (Nunn-McCurdy) reporting and the certification process associated with unit cost breaches are provided in Appendix B.

Table 2. Nunn-McCurdy Critical Unit Cost Breach in FY 2016

Program Name	Acronym	Component	Program Type	Cost Assessment Activity	Activity Date	Supported Event	Event Date
Global Positioning System Next Generation Operational Control System	GPS OCX	Air Force	ACAT ID	CAPE Independent Cost Estimate	11-Oct-16	Nunn-McCurdy Critical Breach Certification	12-Oct-16
				June 2016 Selected Acquisition Report			

MAIS Critical Change Cost Assessment Activities

There were two cost assessment activities in FY 2016 supporting certification decisions associated with MAIS critical changes. For each system with a critical change, Table 3 identifies the program name and acronym, the responsible Component, the supporting cost estimate(s) or analyses presented to the USD(AT&L), and the date of the critical change certification provided to the Congress.

Descriptions of MAIS reporting and the certification process associated with critical changes are provided in Appendix C.

Table 3. Major Automated Information System Critical Change Cost Assessment Activities in FY 2016

Program Name	Acronym	Component	Program Type	Cost Assessment Activity	Activity Date	Supported Event	Event Date
Joint Space Operations Center (JSpOC) Mission System Increment 2	JMS Inc 2	Air Force	ACAT IAM	CAPE Independent Cost Estimate	22-Jul-16	Critical Change Certification	12-Sep-16
				Air Force Cost Position	3-Jun-16		
Air and Space Operations Center – Weapon System Increment 10.2	AOC-WS Inc 10.2	Air Force	ACAT IAM	CAPE Independent Cost Estimate	7-Oct-16	Critical Change Certification	25-Oct-16
				Previous CAPE Independent Cost Estimate	15-May-13		

Remarks about Specific Programs

- The AOC Weapon System Increment 10.2 experienced a second critical change in 2016. The first critical change occurred in late 2012, when the program failed to reach its Full Deployment Decision (FDD) milestone within the statutory threshold. This resulted in a restructure and new baseline for the program, with a plan for achievement of Milestone C in July 2015, and a FDD in July 2016. Subsequently, when the program failed to reach its Milestone C within one year of its baseline date, this triggered a second critical change. The 2016 CAPE cost assessment memorandum made a comparison of the 2016 CAPE ICE to the 2013 CAPE ICE, to facilitate an understanding of what change in program status led to the second critical change in three years. Although the CAPE ICE was completed in FY 2017, most of the analytic work was done in FY 2016.
- There was another critical change in 2016 for the Defense Enterprise Accounting and Management System. Work on the CAPE ICE began in FY 2016, but will be completed in FY 2017 and will be described in next year's Annual Report.

Assessment of Compliance, Quality, and Differences in Methodology

Compliance with Policy and Procedures

All of the events noted in Tables 1 through 3 were supported by the appropriate cost estimates or analyses that complied with the requirements of WSARA and the established cost assessment procedures described in Chapter II. In particular, each MDAP and MAIS milestone or other review (noted in Table 1) was supported by (1) a Component cost position and (2) the appropriate CAPE or military department cost agency ICE. In addition, CAPE provided an independent analysis of savings associated with each proposed multi-year procurement strategy. Additional information about the compliance of CSDR data reporting is provided in Appendix D.

Quality of the Cost Estimates

The overall quality of the cost estimates prepared by each of the military departments has continued to improve due to increased rigor. As noted in Chapter II, DoD has instituted a policy—in place since 2009 for all MDAPs—requiring that a signed, dated Component Cost Estimate and a Component Cost Position be delivered to CAPE prior to delivery of an ICE, to support each milestone or other review of the DAB. Also, the military department's financial and acquisition leadership must provide a statement affirming their commitment to fully fund the program to the Component Cost Position during the preparation of the next Program Objective Memorandum (POM) and President's Budget FYDP.

The quality of the cost estimates for MDAPs provided by the military departments, as well as CAPE, has also continued to improve due to better data. An increased management emphasis throughout the Department concerning the importance of cost data reporting has resulted in significant increases in the quantity and frequency of cost data reports compared to the acquisition reform era of the 1990s. Frequency is important to get the most recent cost actuals and cost performance information. Figure 1 shows the annual volume of CSDR data reports collected

by the Defense Cost and Resource Center (DCARC) for each of the major system commodities. The DCARC is the CAPE field office responsible for administering the CSDR system.

Figure 1. CSDR Data Collection over Time

The emphasis on better data is not limited to the volume of reports. Additional ongoing efforts to improve the content of the specific data reports are described in Chapter IV.

Differences in Methodology

Since enactment of WSARA, any differences in methodology or approach between the cost estimates prepared by the military departments and by CAPE have decreased over time. Generally, the approach employed by the military departments is evolving to become more similar to that employed in CAPE: collect actual cost information from ongoing and historical programs in a product-oriented taxonomy; use that information to prepare cost and schedule forecasts for new programs or programs proceeding to the next milestone in the acquisition process; and review the actual cost information collected, as each individual program proceeds, to update and adjust the cost and schedule forecasts for the program to reflect actual experience. As discussed in the previous section, the goal has been for the Department to improve the systematic collection of actual cost information over time, available to all parties, which has resulted in smaller differences between the cost and schedule forecasts of the military departments and CAPE.

A CAPE analysis made a comparison between the CAPE ICEs and the service cost positions (SCPs), and found that the difference between the two estimates since the enactment of WSARA in 2009 has narrowed significantly relative to the period between 1999 and the enactment of WSARA. The most recent results of this comparison are shown in Figure 2.

Figure 2. Comparison of CAPE Independent Cost Estimates to Service Cost Position

The median difference since enactment of WSARA is 2.1 percent, compared to a median difference of 6.6 percent for the prior period. In addition, the statistical variances have also significantly narrowed, meaning that the post-WSARA estimates are more tightly clustered thus reflecting that the service cost positions are now more closely aligning with the CAPE 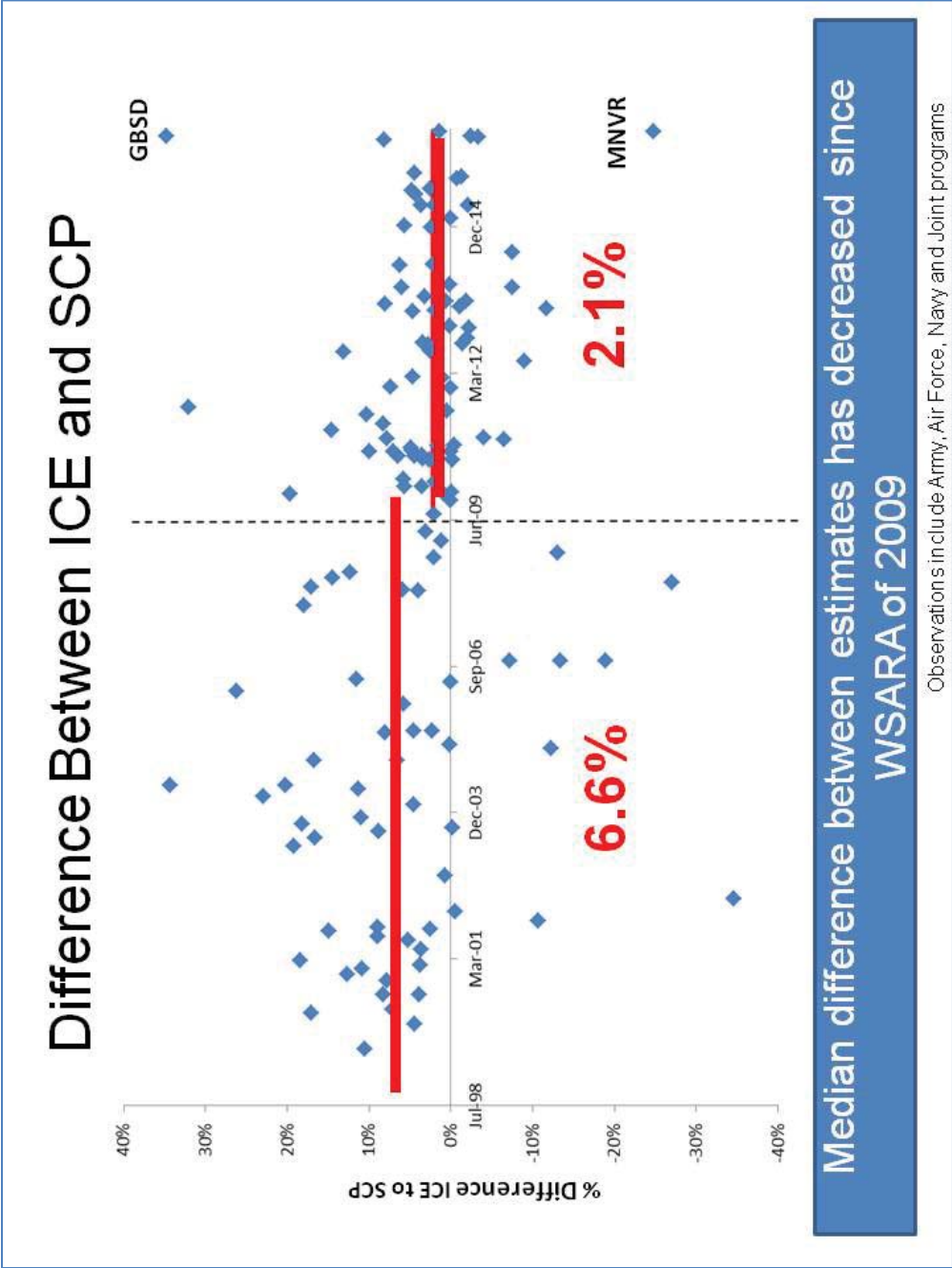ICEs. Despite this narrowing of differences, there have been a few outliers where there was a significant discrepancy (greater than 10 percent) between the service cost position and the CAPE ICE. In such a situation, CAPE and the military department cost agency will meet and assess the reasons for the discrepancy, and determine if there are better data available to reconcile the difference. Failing that, CAPE and the military department will work together to assess how costs can be controlled in the future as the program goes forward.

This year, there were two significant outliers. These two cases were the Mid-Tier Networking Vehicular Radio (MNVR), and the Ground Based Strategic Deterrent (GBSD).

In the case of MNVR, the CAPE ICE is actually 25% less than the Army SCP. The MNVR program will provide networking radios for a wide variety of Army ground vehicles. The MNVR radio hardware has significant commonality with the existing Manpack radio that is one element of the Handheld, Manpack and Small-Form (HMS) program, and MNVR will likely be produced by one of the current Manpack vendors. The primary difference between the two cost estimates is the assumption by CAPE that the MNVR program will benefit from lower hardware costs that reflect prices expected to be offered in the HMS Manpack competitively-awarded procurement contract.

In the case of GBSD, the CAPE ICE is 35% more than the Air Force SCP. The GBSD will be a follow-on intercontinental ballistic missile to replace the aging Minuteman III. The primary difference between the two estimates is driven by the selection of data sources. The Air Force SCP primarily relied upon historical Minuteman and Peacekeeper programs; the CAPE ICE used additional data from the Navy Trident II and the Missile Defense Agency Ground Based Interceptor. Regardless of the merit of either estimate, it was unusually difficult to estimate the cost of a new ICBM program because there was no recent data to draw upon, and the older historical data was of very questionable quality or was nonexistent. This leads to considerable uncertainty and risk in any cost estimate.

As part of its analysis for GBSD, CAPE presented a comprehensive review of the quality of available data that could be used in cost estimates for a future ICBM. A summary of this data review is provided in Figure 3.

Analogous Program Data Quality

	GBSD Scope Definition	Legacy Systems	Available Technical Data	Available Cost Data — Development	Available Cost Data — Production	Age (Yrs)	Composite Value	Basis of SCP	Basis of ICE
Launch Vehicle	Well Defined / Essentially Minuteman III Capability	GBI	G	R	Y	10	Y		X
		EELV Solid Rocket Motors	G	Y	G	0	Y	X	X
		Peacekeeper	G	Y	Y	30	Y	X	X
		Trident I	G	0	0	30/0	0	X	
		Minuteman I / II / III	G	Y	Y	40	Y	X	
		Polaris / Poseidon	Y	R	R	55	R	X	
Post Boost Vehicle	Well Defined / Improved Minuteman III Capability	GBI	G	R	Y	10	0		
		Peacekeeper	Y	R	G	30	0		
		Trident II	G	0	G	30	Y	X	X
		Minuteman III GRP	G	R	G	20	Y	X	X
		GSSAP	G	Y	Y	5			
Restoration	Loosely defined / significant assumptions	SSGN	R	N/A	Y	10	Y		X
Command and Control	Loosely defined / significant assumptions	GBI	Y	R	R	10	R	X	X
		Minuteman	G	R	R	50	R	X	X
		Trident II	G	Y	Y	0	Y	X	
Ground Infrastructure	Loosely defined / significant assumptions	GBI	Y	R	R	10	R	X	X
		Minuteman	G	R	R	50	R	X	X
		WCS	G	N/A	G	0	G		X

Legend:
- B — Ideal, CSDR, WBS content known
- G — Good, CSDR, small uncertainties in WBS content
- Y — OK, CTR provided, questionable content/unknown scope of WBS
- 0 — Fair, budget level
- R — Poor, no data or useless data

Data Quality Is a Major Contributor of Uncertainty in the Estimate.

Lesson Re-learned: Cost Data Collection Needs To Be A Priority.

Figure 3. Assessment of Data Quality for GBSD Program

Ongoing efforts to strengthen cost data collection and improve cost data quality for all defense acquisition programs are described in Chapter IV.

Acquisition Program Cost Performance

One simplistic measure of acquisition program cost performance is the annual rate of Nunn-McCurdy unit cost breaches that have occurred over time. The number of significant and critical breaches by year from 1997 to 2016 is displayed in Figure 4.
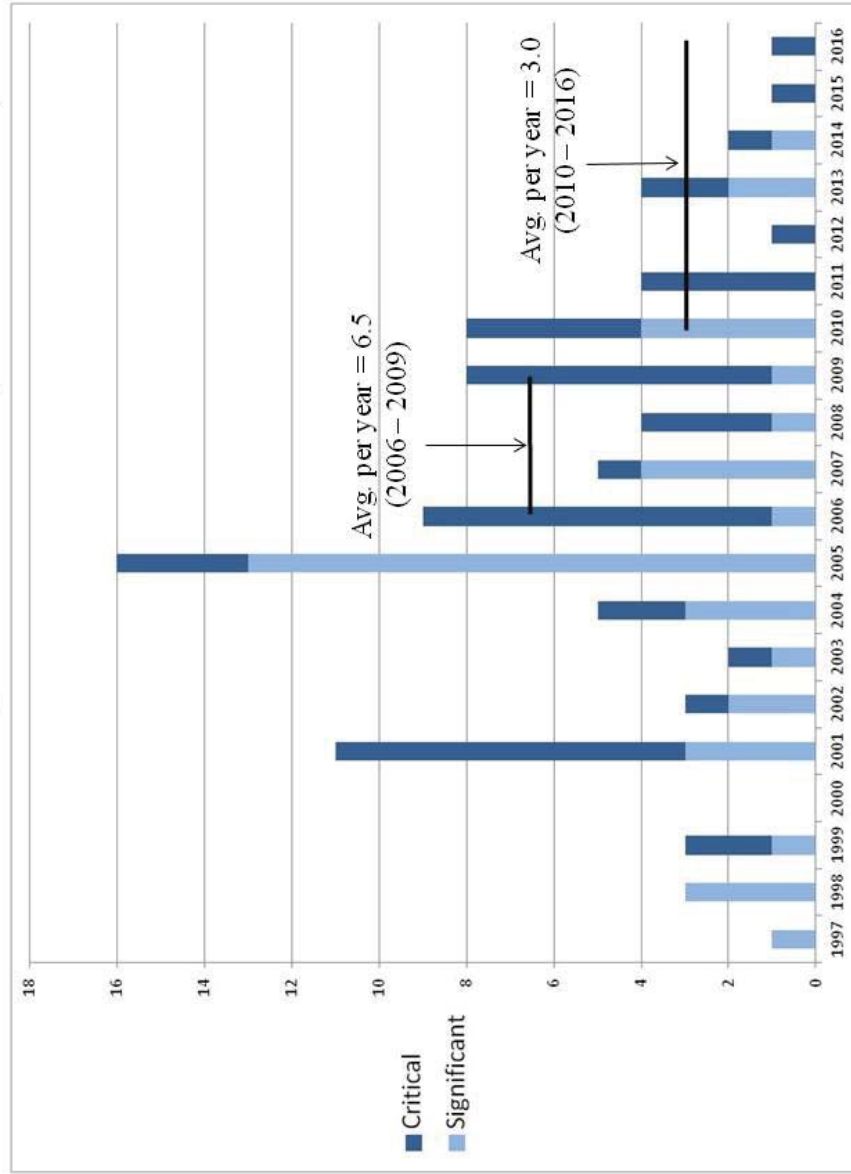
Figure 4. Number of Nunn-McCurdy Breaches by Year

It is important to note that the National Defense Authorization Act for FY 2006 made changes to the criteria for a Nunn-McCurdy breach by adding a requirement to report unit-cost growth from the original program baseline as well as the current (possibly revised) baseline. This additional requirement caused a large spike in 2005, when 11 programs had to report preexisting significant breaches. Thus, for historical comparisons, the period before 2006 is not comparable to the period after that. For the more recent period, the average annual number of breaches has declined since the enactment of WSARA in 2009.

More sophisticated data-driven analyses of MDAP acquisition cost performance is provided in the USD(AT&L) publication, *Performance of the Defense Acquisition System, 2016 Annual Report*. This document is available on the DoD website www.acq.osd.gov/fo/docs/Performance-of-Defense-Acquisition-System-2016.pdf.

Areas for Improvement

In a few cases, our cost estimates involved programs that had plans or the potential for foreign military sales (FMS). FMS cases have significant possible benefits in lowering the costs of programs to the United States, since the procurement of additional systems will lead to unit cost reductions for all parties. In some cases, the foreign country may also contribute to the recoupment of prior development costs. However, quantifying these benefits in cost estimates can often be challenging, due to the complexities of issues such as coproduction, tie-ins with United States MYP contracts, and forecasting the effects on contractor business bases and rates. Nevertheless, assessing the implications of FMS provides a better understanding of the complete costs for the United States. CAPE is now evaluating how to improve the cost community tools, methods, and policies for cases involving FMS.

Other Cost Assessment Activities in FY 2016

CAPE ICE for F-35 Operating and Support Costs

This year, CAPE updated its estimate of O&S costs for the F-35 fighter aircraft. This estimate was updated to support the preparation of the F-35 December 2015 Selected Acquisition Report (SAR), submitted to the Congress in March 2016.

The CAPE O&S cost estimate includes all three U.S. F-35 aircraft variants; is based on a 30-year service-life forecast; and reflects planned flying hour rates for each of the applicable military services. The estimate incorporates updated information regarding the major elements of O&S costs. This includes: updated fuel consumption rates for all aircraft variants; a reduction in the assumed fuel price per gallon; use of updated price escalation rates of government (military and civilian) and contractor personnel; a revised cost estimating relationship for hardware modifications; and updated maintenance costs for depot level repairable items, based on the latest component reliability projections obtained from approximately 31,000 hours of flight testing and field operations.

The December 2015 SAR also provides a normalized comparison of the cost per flying hour for the Air Force F-16 C/D fighter relative to the Air Force F-35 conventional takeoff and landing variant. In this comparison, the CAPE estimate of the F-35 cost per flying hour is roughly 20%

greater than the F-16 C/D cost per flying hour. It is reasonable to expect that the F-35 fifth-generation fighter aircraft would be more costly to operate and sustain than the F-16 C/D fourth-generation fighter aircraft, given the substantial increase in military capabilities provided.

DoD Contract Pricing and Cost Estimating Collaboration Conference

For some time, CAPE and the other organizations in the cost estimating community have collaborated with the cost and price analysts in the contracting community. The cost and price analysts support source selections, proposal evaluations, and contract negotiations, and ultimately ensure that the Government pays fair and reasonable prices for its purchased goods and services. To support such collaboration, CAPE worked with the USD(AT&L) Director of Defense Pricing, and the Director of Defense Procurement and Acquisition Policy, to jointly sponsor a three-day conference in July 2016 at a low-cost facility in Leesburg, Virginia. The conference featured speakers and panel discussions with representatives from both communities. It allowed cost estimators and contract pricing analysts to educate each other on respective missions, products, and process, and identified opportunities for data sharing and collaboration on analytic methods for mutual benefit.

The agenda, speaker biographies, and presentations are available to registered users with a CAC at the web site https://extranet.acq.osd.mil/dpap/cpic/coference/index.html.

DoD Cost Analysis Symposium

For several decades, CAPE (and its predecessor organization) has sponsored an annual DoD Cost Analysis Symposium, known as DoDCAS, with attendees drawn primarily from government and private-sector cost research and analysis organizations. DoDCAS provides a valuable forum for the education, training, and improvement of communication within the DoD cost analysis community. The presentations made at DoDCAS facilitate discussion, instruction, and debate concerning cost estimating methods and models, data collection, and contemporary issues of interest to the DoD cost community. In this way, the event leverages the knowledge and experience of the community to increase individual and collective expertise in cost estimation and analysis. DoDCAS also provides members of the DoD cost community the opportunity to hear the insights of senior DoD and other government officials on important topics.

In recent years, the symposium event has been for the most part been cancelled or curtailed due to guidance from OMB and the Deputy Secretary of Defense to reduce expenditures for all conferences and travel. Also, a major concern has been that the potential DoD and other government agency attendees would not have travel funding available to attend the event. In FY 2016, CAPE did not hold a symposium in order to support the contract pricing and cost estimating mentioned earlier. CAPE is now examining options to hold a symposium next year at a low-cost facility where virtual attendance could be made available to those who could not physically attend.

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CHAPTER IV – THE LOOK FORWARD

Since the enactment of WSARA in 2009, CAPE has made significant progress in implementing the requirements of the legislation and meeting the evolving needs of the Department. This chapter discusses the status and future plans for several key initiatives that comprise the reform effort.

Cost Leadership Forum

The CAPE Deputy Director for Cost Assessment has established a periodic meeting (known as the Cost Leadership Forum) held with the leaders and senior staff of the military department cost agencies to discuss issues of common interest to the community. The intent is to establish greater collaboration among CAPE and the military department cost organizations by sharing analytic best practices, and developing a collective vision of the path forward for the cost community over the next five years in meeting WSARA objectives, improving cost analysis, and improving business processes to deal with the challenges of the current constrained resource environment.

The Cost Leadership Forum meets quarterly. Some of the major topics discussed at the Forum include:

- Cost assessment policies and procedures
- Enhanced cost data collection
- CADE improvements
- Inflation and price escalation
- Training and education for the cost community

The current plans and ongoing initiatives for each of these topics are described in the remainder of this chapter. The Cost Leadership Forum will continue to meet quarterly and provide executive oversight for these and other initiatives.

In addition, the Cost Leadership Forum has discussed issues with staffing levels in the organizations in the DoD cost community. These organizations are affected by the 25 percent reductions in headquarters, administrative and support activities that must take place between FY 2015 and FY 2019, as mandated by the National Defense Authorization Act for FY 2016.

Policies and Procedures

The various guidance documents that were completed and issued concerning cost assessment policy and procedures were described in Chapter II. Efforts are ongoing to make further additions and improvements to the overall cost estimating guidance, and to respond to recent legislation and other fact-of-life changes. Additionally, there will be an update to the procedures concerning improvements to the cost data collection process.

Recent Legislative Changes

There were significant changes to acquisition policy and statutory requirements made by the National Defense Authorization Acts of FY 2016 and FY 2017. These changes are now being

assessed by USD(AT&L) and CAPE to determine the appropriate revisions that will need to incorporated into DoD Instruction 5000.02, *Operation of the Defense Acquisition System*, and DoD Instruction 5000.73, *Cost Analysis Guidance and Procedures*.

The National Defense Authorization Act for FY 2016 has certain provisions intended to move acquisition oversight of MDAPs away from OSD and to the military department headquarters. Section 825 (Designation of Milestone Decision Authority) specifies that the MDA for an MDAP reaching Milestone A after October 1, 2016, shall be the service acquisition executive of the military department managing the program, unless under certain specific circumstances the Secretary of Defense may designate another official as the MDA. Section 802 (Role of Chiefs of Staff in the Acquisition Process) enhances the role of the Chiefs of Staff in the defense acquisition process, and provides specific responsibilities to the Chiefs of Staff and Secretaries of the Military Departments for balancing resources against priorities on acquisition programs and ensuring appropriate trade-offs are made among cost, schedule, technical feasibility, and performance throughout the life of each acquisition program.

The National Defense Authorization Act for FY 2017 has additional provisions pertaining to defense acquisition that will affect cost assessment procedures. Section 808 (Transparency in Major Defense Acquisition Programs) requires that the MDA for an MDAP shall provide the congressional defense committees with a brief summary report ("acquisition scorecard") no later than 15 days after granting approval at Milestone A, B, or C. The summary report provides certain information about the program pertaining to cost, schedule, and technical, manufacturing, and fielding risks. In particular, the summary report will provide (1) the estimated cost and schedule for the program established by the military department concerned, and (2) the statutory independent estimate for the cost of the program, and any independent estimate for the program schedule. Section 842 (Amendments Relating to Independent Cost Estimation and Cost Analysis) makes clarifying amendments to the existing statutes pertaining to independent cost estimation. At Milestone A, the ICE shall now include the identification and sensitivity analysis of key cost drivers that may affect life-cycle costs of the program. In addition, the statutory requirements for confidence levels in cost estimates (that were described in Chapter II) are replaced by new requirements for discussion of risk, the potential impacts of risks on program costs, and approaches to mitigate risk in cost estimates. Section 846 (Repeal of Major Automated Information Systems Provisions) removes the statutory provisions pertaining to MAIS programs, including the critical change procedures, effective September 30, 2017. Section 849 (Improved Life-Cycle Cost Control) makes several amendments pertaining to life-cycle cost controls of a program. In particular, the military departments are required to conduct a sustainment review five years after declaration of initial operational capability of a MDAP and throughout the system's life cycle, using availability and reliability thresholds and cost estimates as the triggers that prompt such a review. Section 901 (Organization of the Office of the Secretary of Defense) modifies the position of USD(AT&L) by replacing this position with two new positions: the Under Secretary of Defense for Research and Engineering, and the Under Secretary of Defense for Acquisition and Sustainment.

Acquisition of Services

The USD(AT&L) issued DoD Instruction 5000.74, *Defense Acquisition of Services*, in January 2016 to establish new policies, responsibilities, and direction for the acquisition of contracted services. In this instruction, CAPE is now responsible for establishing policies and procedures for conducting cost estimates and analysis for the acquisition of contracted services. This is new ground for CAPE, and will require research and investments in methods and data.

Cost Analysis Requirements Description Update

As described in Chapter II, the CARD is used to establish formal program definition that is used as the basis for cost estimates. The CARD format is now being improved with the addition of a new streamlined data template for the collection of technical data (design and performance parameters) that will replace much of the extensive narratives and tables. In the revised format, the narrative format with tables and diagrams will be reduced to 20-30 pages. The technical data will be provided through standardized spreadsheet templates specific for each weapon system commodity type (such as aircraft, ships, and missiles). In the future, CARDs will be updated annually (in support of program and budget reviews), and not just at acquisition milestone reviews. It is anticipated that CARDs for milestone reviews will follow the new format beginning some time in 2017, and annual CARDs will use the new format beginning in October 2017.

Enhanced Cost Data Collection

Over the past few years, as noted in Chapter II, CAPE and the DCARC have made considerable progress in restoring systematic cost data collection. However, based on feedback from government users about desired report enhancements, as well as advancements in information systems technology, CAPE and the military department cost agencies have established several related working groups supporting various initiatives to improve the quality for data collection and reporting and increase efficiency through better business processes.

The new policies and procedures that will support the enhanced cost data collection initiatives will be incorporated into a new issuance of DoD 5000.04-M-1, *Cost and Software Data Reporting Manual*. The revised manual will be published in 2017.

One of these initiatives concerns cost data collections and reporting for ACAT II/III acquisition programs (i.e., programs that are not sufficiently expensive to qualify as MDAPs). The military departments will begin collecting cost data on high-priority ACAT II/III programs in 2017. Cost data collection on other ACAT II/III contracts over $100 million will begin in 2018.

Current efforts to incorporate training and education concerning cost data collection into the curriculum at DAU and other educational institutions are discussed later in this chapter.

CAPE is also now working with the Missile Defense Agency to establish cost data collection for missile defense programs. Although these programs are exempt from DoD Instruction 5000.02, *Operation of the Defense Acquisition System*, the Agency nevertheless has instituted a policy to collect CSDR for its high-cost programs. For such programs, the CSDR plans are subject to approval by CAPE.

Other specific initiatives to improve cost data collection that will be incorporated into the revised CSDR manual are described in the remainder of this section.

Reinvigorate the Cost Working-group Integrated Product Team

In the current CSDR cost data collection procedures, the stated policy has been to establish a formal working group (known as the Cost Working-group Integrated Product Team, or CWIPT) early in a program's planning for cost data collection. In principal, the CWIPT should include active representation of all CSDR stakeholders, including CAPE and military department cost analysts, the cognizant cost field organizations, the DCARC, the program office, and representative contractors where appropriate. The CWIPT should be established well in advance of any solicitations or Request for Proposals (RFPs) to industry, and it would ensure that timely proper plans and reporting requirements for cost data reporting and collection were in place. The CWIPT should also continue to remain active during contract execution to ensure data quality and compliance with approved plans. However, in most cases, the formation of a strong CWIPT seldom occurred in practice. This led to the DCARC staff, which is limited in size, to carrying the major burden of monitoring program office activities for compliance with CSDR policies and procedures. This in turn has resulted in uneven compliance and data quality.

To remedy this situation, CAPE and the leaders of the military department cost agencies have decided to reinvigorate the role of the CWIPT in actual practice. There are now monthly meetings with senior representatives from CAPE, the military department cost agencies, EVM proponents from USD(AT&L) and the military departments, and appropriate program offices. These meetings are held to review upcoming contractual solicitations or RFPs, and to identify a leader and points-of-contact for each CWIPT. The meetings also will stress the importance of community-wide validation of CSDR submissions. The status at each meeting will be provided to the leaders of CAPE and the military department cost agencies for periodic engagement to ensure that the leaders of the cost community are stressing the importance of community-wide cost data collection.

FlexFiles Initiative

Today acquisition cost data is collected in the many forms of the legacy CSDR report formats, first created in the 1960s. Contractors currently must make manual allocations from their financial and other accounting systems into these formats. CAPE, partnering with the military department cost agencies, has commissioned a government team to achieve more efficient and better data transfers by working with industry to enable the automated submission of low-level cost data directly from contractors' accounting systems into the government systems. Instead of collecting data annually at best— and in some cases many years apart—the data collections will be available as needed and in some cases aligned with the monthly Earned Value submissions. This means that contractors will no longer have to manually convert one set of data into another structure, eliminating a source of inevitable data errors. This transformation, which is the next generation of cost data collection, will improve data quality, reporting compliance and timeliness, and also reduce the reporting burden on contractors. This initiative is known in the cost community as FlexFiles.

The development of the report formats, definitions, and instructions for the proposed FlexFiles reporting has occurred iteratively. During each iteration, there have been proof-of-concept pilot programs. In addition, after each iteration, a draft of the formats and instructions has been circulated to industry and government cost organizations for comments and suggestions. The first draft of the formats and instructions was completed in August 2015; a second draft was completed in February 2016; and third draft was completed in May 2016. The most recent draft was completed in October 2016 and is now out for government and industry comment. It is anticipated that the gradual phase-in of FlexFiles cost reporting will begin on new contracts in during 2017, with full implementation at the end of FY 2017.

Improved CSDR Planning

A CSDR plan is submitted for approval when a program begins cost and software reporting. Each plan specifies the required reports and submission frequency for the major contracts and subcontracts. The Air Force has led an effort to develop formal standards for CSDR plans that provide a template of the reporting structure for each weapon system commodity type (i.e., aircraft, electronic system, missile, etc.). These standards provide consistency in data reporting across programs within a commodity type, and provide better communication of government expectations to industry. These standard plans were placed on an initial set of Air Force contracts where the standards were tested. The standard plans also were reviewed by analysts in CAPE and the other military departments, and were extended to ships and ground vehicles. The standard plans are now available on the CADE website, and will be incorporated into CSDR reporting (subject to CWIPT review and approval) for all of DoD.

In a related initiative, CAPE is working with USD(AT&L) and program managers to establish a joint planning process for CSDR and EVM reporting. This is intended to ensure more consistent and efficient reporting where all data requirements are simultaneously identified and on contract as early as possible. The format and instructions for a joint CSDR-EVM reporting plan, to be submitted by program offices, has been developed and will be incorporated into a standard CSDR co-plan.

Software Data Reporting Initiatives

The Cost Leadership Forum sponsored a working group devoted to improved software data collection and reporting. There were three main Forum-approved recommendations that have made significant implementation progress this year. These are (1) publishing the new software data formats, definitions, and instructions to reporting contractors for use in collecting key software metrics for cost estimators across DoD and other agencies, (2) a joint DoD validation and verification guide, team, and process that reached initial operational capability this year, and (3) an up-to-date central software database that is now available throughout DoD through the CADE system. These data process improvements eliminate duplication of effort that was occurring across the military departments and will improve the consistency and quality of software cost estimates for major acquisition programs.

The new software data formats and reporting instructions remedied issues in current data reporting, to include lack of visibility and inconsistency in current data, as well as some reporting

elements that were too complex for submitting organizations. A critical note is that the data formats and reporting instructions were expanded to include major software maintenance activity. Working with industry, the software working group ensured these new data formats and reporting instructions used state-of-the-art terms, definitions, and metrics for software development and maintenance.

The software reporting working group also found that data submissions were not subject to a complete and rigorous quality control process. As a result of this finding, the team designed and began institutionalizing a Verification and Validation (V&V) process. This year, a joint team of subject matter experts from CAPE, the military departments, and the Missile Defense Agency (MDA) was formed and achieved initial operating capability of the new V&V process. This team uses a formal V&V Guide, published last year, to review all software data reports and provide early, consistent, and relevant feedback to DCARC and the submitting organizations regarding data-quality issues. The team's review process is making a difference, ensuring only quality data reports are accepted into the CADE system.

Beyond the improvement of individual data reports and V&V process, the long-term goal is to assemble the data into a comprehensive and authoritative central software database with user-friendly tools available for all cost analysts. The working group found many distributed databases and significant duplication of effort that existed throughout the department. Additionally, the team determined that database quality improvement could be achieved through one centralized database. The working group reviewed existing databases and made several recommendations on features for a new central database. As of December 2016, an updated MS Excel-based version is complete and will be available centrally within CADE. The working group via CADE continues to work improvements to the timeliness and user-friendliness of the software database, as well as working to update its capability to accept the data reporting changes introduced by the new software data formats (e.g. new software maintenance elements). The software database will be incorporated into CADE discussed later in this chapter.

A modification of the improved software report format is being developed for an important class of MAIS programs known as Enterprise Resource Planning (ERP) systems. A draft of the modified format has been circulated to agencies and program offices that manage ERP systems for comments and suggestions, and it has also been reviewed by ERP commercial vendors. Trial use of the modified format is now underway with two pilot ERP systems.

Technical Data

Cost analysts often need technical data (i.e., design and performance parameters) for legacy and new systems to make adjustments for complexity or develop cost estimating relationships used in estimates. To address this need, another working group (the Technical Data Working Group) was formed with representatives from CAPE, the military department cost agencies, and the Systems Engineering and Logistics and Materiel Readiness organizations in USD(AT&L). This cooperation ensures that the parameters, units, and collection methodologies proposed for technical data reporting are consistent with DoD and industry data taxonomies and processes.

The working group has developed standardized data template formats that specify the universe of technical parameters that can be collected for each weapon system commodity type (i.e., aircraft, ships, missiles, etc.) and defines each parameter consistent with systems engineering practices, military standards, and industry guidelines. The resulting data templates serve as the basis of a new report called the Technical Data Report that will be added to CSDR reporting on contracts in the future. Drafts of the data templates and instructions to reporting contractors have been circulated for comment throughout the military departments and industry. Final versions will be completed pending lessons learned from pilot programs.

Cost Data Reporting for Sustainment Contracts

CAPE has continued to improve the collection and reporting of contractor actual costs for major sustainment, logistics, and maintenance contracts. The military department VAMOSC systems (described in Appendix D) provide limited visibility into actual costs when a weapon system is sustained through Contractor Logistics Support (CLS) or similar arrangement. The VAMOSC systems may in some cases collect and display CLS costs in aggregate, but without providing any details by cost element such as depot maintenance or sustaining engineering.

The first cost data report for sustainment was approved in May 2012 and became effective at that time. This summary report collects and displays contractor costs by sustainment cost element. A second cost data report (known as the Functional Cost-Hour Report) was approved in September 2015. This report, for selected high-cost elements, collects and displays contractor costs by sustainment cost element and functional category (such as materials and maintenance labor). These reports are now required on major sustainment contracts and subcontracts worth more than $50 million. Additional data reports are now being developed to collect more detailed cost data for maintenance events and repair parts, similar to the data already collected by maintenance data collection systems for weapon system platforms supported under organic maintenance.

Data Collection on Indefinite Delivery/Indefinite Quantity Contracts

Currently one of the most problematic data gaps facing the DoD cost community is the lack for cost data for modernization upgrade and sustainment efforts on major platforms such as the B-2 and F-22. Such efforts typically use a certain type of contract arrangement known as an Indefinite Delivery/Indefinite Quantity (IDIQ) or other similar arrangement such as a Basic Ordering Agreement. These arrangements are used to expedite contracting for supplies and services when specific quantities and prices are not known at the time of the award of the arrangement. As the requirements are established, the government places delivery orders (for supplies) and task orders (for services) against the basic arrangement for each discrete requirement. Cost data reporting has not been imposed on these arrangements, even though individual delivery orders, or the aggregate of several delivery orders, may exceed CSDR reporting thresholds.

To remedy this, for contractors with modern financial systems capable of producing CSDRs, CAPE now requires the collection of cost and software data on delivery/task orders on IDIQ contracts that directly support an MDAP, MAIS program, or Major System (i.e., ACAT II program) where individually, or in aggregate, the value of the delivery/task order(s) related to the system being supported is likely to exceed existing CSDR threshold figures over the life of the

IDIQ arrangement. This data will be collected in accordance with existing CSDR policies and procedures.

Data Collection on Government-Performed Efforts

In the past few years, CAPE and the military department cost agencies have worked with government-executed elements of acquisition and sustainment programs, as the lack of data on these efforts impedes accurate compilation of total program costs. One of the roadblocks preventing the collection of government cost and software data has been the lack of modern financial systems employed by the government. With the advent of new government financial systems, the only remaining impediment is a lack of specific policy. Therefore, as the government implements modern financial systems in our organizations and depots, CAPE now requires government-performed efforts that meet CSDR thresholds to collect and submit cost and software data following the processes outlined in existing CSDR policies.

Cost Assessment Data Enterprise

CAPE is partnering with the military department cost agencies and USD(AT&L) staff to incrementally work towards the CADE vision of the government cost analyst's centralized database and virtual library, housing seamless integrated authoritative data sources that are easily searchable and retrievable. The objectives of CADE are shown in Figure 5. CADE is now widely available to an expansive user community of roughly 1,870 users, with roughly 70 percent of them in the military departments.

CADE Objectives

Provide decision makers with relevant, high quality, timely and actionable analyses for better acquisition strategies and execution

- Move from reactive to proactive
- Insight equates to trust and facilitates faster and more knowledgeable decision making
- Facilitate telling the program's "story", holistic analysis

Improve Analyst Productivity (at all levels: OSD, Services, Program Offices)

- Increase output per unit time, without degrading confidence in results
- Provide near real-time access to data, more data, and less burden on the analyst to retrieve and process
- Reduce time for analyst to climb the program familiarization learning curve

Comprehensiveness

- Having all DoD's relevant data at analysts' fingertips for comprehensive assessments, regardless of analysis type

Community Knowledge Sharing

- Gain insight from previous and fellow analysts and data stakeholders

Quality and Transparency of Source Data

- Where it comes from, what we know about it – consistency
- Enterprise data stewardship – Enterprise agreement and accountability for what data means and how it's used
- Reporting Compliance Improvement

Properly Secured

Figure 5. Cost Assessment Data Enterprise Objectives

CADE will provide immediate analyst access to the complete range of available cost data. Initially, this will include EVM reports, current CSDR reports, and O&S data. CAPE is also working with USD(AT&L) to capitalize on the acquisition data and reports already collected in the various acquisition information systems and to integrate them with the cost data to provide the government analyst with a full view of a weapon program or portfolio. CADE will provide visual analytic tools that can be used to provide automated trend analyses and other views of program performance. Analysts also will be able to retrieve other relevant studies and reports from other government agencies and Federally Funded Research and Development Centers.

CADE not only will store authoritative cost, acquisition and technical data, it will also contain the Department's own institutional knowledge for each of the programs, improving communication throughout our cost community and across OSD. This will allow tomorrow's analysts to learn from the experiences of today's, and it will provide today's analysts with a way to save their carefully produced analytics between milestones, so they can return years later and not have to start their analysis all over again with no previous information. It will provide a fuller history capturing previous work, enabling more holistic and comprehensive analyses to be developed. CADE includes a document repository to house CARDs, ICEs, Component Cost Positions, DAB and Overarching Integrated Product Team Briefings, and Full Funding Certification memoranda. These documents are stored at the portion of the CADE library accessible only to government personnel.

Ultimately, the goal is to reduce time spent on *ad hoc* data collection and validation, allowing more time for actual analysis at a much deeper level, and quicker ability to see how a program is performing between major reviews. This initiative will increase the productivity of analysts and will also provide a way for them to build upon each other's work, whereas, historically, analysts typically engaged in separate efforts. This will allow the cost community to be a more efficient and productive workforce, which will become more critical in an era of human resource constraints.

The CADE project is being managed using an agile software development process that is supported through an integrated master schedule of the development effort. The priority now is to incorporate the new data reports (including the FlexFiles cost reports, software data reports, and technical data reports all discussed earlier) into CADE as they become available. There is also on ongoing outreach and training program for the current 1,870 CADE users all across the country.

CAPE is now working with the National Nuclear Security Administration (NNSA) to establish DCARC-like cost data collection that will be available on a CADE-like data warehouse in a classified environment. This effort will begin with the weapons programs, but eventually will be extended to NNSA infrastructure programs as well.

Current efforts to incorporate training and education concerning CADE and its functionality into the curriculum at DAU and other educational institutions are discussed later in this chapter.

Contracts Price Database

CADE not only hosts cost data reports, but it also hosts contract data. Over the past decade, the military department cost agencies have funded the development of a Contracts Price and

Schedule Database. Now containing more than five hundred million dollars in contract value across a wide range of commodities, this database is unique in providing information at the Contract Line Item Number (CLIN) level. In cases where CSDR and EVM reporting requirements were not put in place, these CLIN-level data may be the only cost data available to the cost community. Where CSDR and/or EVM data do exist, the database provides useful contextual information (such as contract type or profit margin) and important cross-checks to other cost data. The database can also be used to construct metrics for cost and schedule growth experienced over contract execution.

Cost Indices

WSARA—as codified in section 2344 of title 10, United States Code—requires that CAPE periodically assess and update the cost indices used by the Department to ensure that such indices have a sound basis and meet the Department's needs for realistic cost estimation. Based on recent studies, which were described in earlier editions of this Annual Report, the current practice in the DoD cost community now makes the distinction between inflation and price escalation.

Inflation refers to an increase in the general price level across the entire economy as a whole. To account for inflation in budgeting and cost estimates, each year the Under Secretary of Defense (Comptroller) issues inflation guidance derived from forecasts made by the administration and issued by OMB.

Price escalation refers to changes in prices of a specific good or service. Escalation accounts for not only inflation, but also any real price growth experienced in a specific industry or commodity group. Escalation may also account for any real price growth associated with a specific contractor (such as costs of direct labor or overhead).

The cost community now considers the use of both inflation and appropriate escalation indices in cost estimates to be a best practice. This approach is intended to provide the most realistic forecast of future prices, taking specific markets, products, and contractors into consideration. To institutionalize this practice throughout the Department, CAPE has published *Inflation and Escalation Best Practices for Cost Analysts* that was released in April 2016. This publication is available on the CAPE web site (www.cape.osd.mil) at "Public Reports." CAPE is now working with the military department cost organizations to implement these best practices. For example, the cost baseline for the Ohio Replacement Program used a preferred inflation index to express acquisition costs in constant dollars, improving comparability of cost estimates and actual across weapon programs.

Additional ongoing efforts include producing a more in-depth handbook explaining specific processes, computations, and data sources that can be used by analysts in the preparation and documentation of inflation and price escalation in cost estimates. CAPE is also working with DAU to incorporate the standard terminology and best practices into current cost analysis training and education. Finally, CAPE is developing an escalation guide intended for laymen.

Cost Analysis Education and Training

In order to improve the education and training of the DoD civilian and military workforce in cost assessment, CAPE and the military department cost agencies formed an Education and Training Working Group that periodically reports its status to the Cost Leadership Forum. The overarching objective of this working group is to develop relevant education and training standards across the cost community.

CAPE, in partnership with USD(AT&L), now co-chairs the oversight group responsible for approval of the curriculum associated with DAU and other courses leading to professional certification in Acquisition Cost Estimating. Initially, the working group developed a framework of desired core competencies—for apprentice, mid-level, and senior cost analysts—that will be used to guide education and training standards for course content. The working group has now worked with DAU to review the entire curriculum and course content and to ensure that the desired core competencies are being addressed. In the future, this review of course content, relative to the desired core competencies, will be expanded to other sources of training and education outside of DAU.

CAPE has supported the Navy and the Naval Postgraduate School (NPS) in establishing an accredited Master's Degree Program in Cost Estimating and Analysis (MCEA) that began in April 2011. This two-year, distance-learning program is a vital element of the education of the cost estimating community and improvement of cost estimates in both DoD and the defense industrial base. The program is part-time and consists of two courses per quarter, for eight quarters, with courses taken from operations research, systems engineering, and business and public policy. The program blends web-based, online instruction with video-televised education, and is tailored to students whose careers will not allow them to participate in a full-time, traditional, on-campus program. In the final two quarters of the program, each student works on a capstone research project that is sponsored by a government organization in the cost community. Tuition may be paid through the use of the Defense Acquisition Workforce Development Fund. The first four cohorts have graduated. The fifth and sixth cohorts are now in attendance. The seventh cohort will start in April 2017, and graduate in March 2019.

The Air Force has established its own Master's Degree Program in Cost Analysis (MCA) at the Air Force Institute of Technology (AFIT). This full-time graduate program is designed to advance the knowledge and creative problem-solving skills needed to effectively estimate program resources within the global military, DoD, and Air Force environments. The program curriculum integrates a strong foundation in quantitative concepts and techniques with specific military cost-related topics to prepare students to contribute effectively in a variety of complex and challenging roles in the global military arena. Besides the weapon system cost sequence, the curriculum includes courses in mathematical methods, quantitative decision making, economics, risk, systems engineering, and maintenance and production management. Program graduates are well grounded in course work related to follow-on assignments pertaining to cost estimating within the financial management field at the base, major command, and higher levels.

CAPE and the military departments are also working to establish more specialized technical training. The DAU curriculum is now being modified to include a unit on DoD cost data

collection in program management and cost estimating courses. There also have been numerous training events on inflation and price escalation. In the future, the education and training working group will be conducting a review of VAMOSC training.

In addition, education and training specific to CADE and its functionality are now being developed for incorporation into the curricula at DAU, NPS, and AFIT. CAPE has stood up a training system known as the Functional Academic Cost Assessment Data Enterprise, or FACADE (pronounced "fake-CADE"). FACADE has all the same functionality as the CADE portal but is populated with a robust set on non-proprietary programs representative of DoD acquisition programs. CAPE is continuing to fund the population of FACADE with additional data sets sufficient for the development of a wide range of case studies and other student exercises. Training with the FACADE system supports the teaching of analytic cost assessment techniques using practical, real-world examples, while simultaneously supporting the teaching of navigation and use of CADE, with both as important elements of the cost analysis curricula.

Finally, CAPE has worked with DAU on the development of a five-day course specific to software cost estimating. The course emphasizes the unique characteristics in the software development environment and their effect on the cost estimating process. These characteristics include estimating the size of the software application; converting software size to development effort; estimating the schedule for completing the development effort; and maintaining the software throughout the operational phase. The course helps students develop reliable and credible software cost estimates through the use of numerous class exercises designed to convey the complex interrelationships of software size and complexity, programming environment, staffing, and scheduling. An abbreviated five-hour version of this class is available on-line as part of DAU's continuous learning program.

Tracking to Approved Estimate—Program/Budget Review and Acquisition

The current acquisition process in the Department is event-driven and episodic in nature, and is driven primarily by the key milestone and other review events identified in statute and regulation. CAPE and the military department cost agencies are moving to a more continuous approach in following and tracking program performance, updating cost and schedule estimates, and evaluating new program risks and issues as they are identified.

As part of the Department's program and budget review process, CAPE—in conjunction with USD(AT&L)—reviews each major acquisition program with significant funding changes from the latest baseline or prior year's President's Budget to determine the source of the cost estimate supporting the revised program and to ensure that the program remains fully funded. As noted earlier, the CARD will in the future be updated annually to support such analyses.

Summary

CAPE is continuing to develop and refine initiatives for the Department's cost estimating and cost analysis functions. Implementation of these initiatives will ensure that the cost assessment organizations, policies and procedures, tools and methods, data collection systems, and training and education programs will be strengthened and improved as necessary to meet the expanded roles and responsibilities of the DoD cost community.

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Appendix A.

Cost Analysis Organizations in DoD

Independent Cost Assessment Organizations

There are four key offices for the preparation of independent cost estimates (ICEs), one in the Office of the Secretary of Defense (OSD) and three within the military departments. The office within OSD responsible for ICEs reports to the Director, Cost Assessment and Program Evaluation (DCAPE). Within the military departments, the offices all report to their Assistant Secretary for Financial Management and Comptroller. The following paragraphs give a brief description and overview of these four key offices.

OSD – Deputy Director for Cost Assessment

The CAPE Deputy Director for Cost Assessment prepares ICEs for all Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) programs when acquisition oversight has not been delegated to a military department or Defense Agency, and reviews all cost estimates and cost analyses prepared by the military departments and Defense Agencies in connection with other MDAPs and MAIS programs. The Deputy Director for Cost Assessment provides leadership to the entire Department of Defense (DoD) cost community with regard to workforce development and management, policy and procedures, cost data collection, cost analysis education and training, and cost research.

Army – Deputy Assistant Secretary of the Army for Cost and Economics

The Deputy Assistant Secretary of the Army for Cost and Economics (DASA-CE) develops ICEs and Component cost analyses for Army weapon and information systems. DASA-CE conducts independent reviews and validation of business case analyses, economic analyses, and special cost studies of major weapon and information systems, force structure, and Operating and Support (O&S) costs. DASA-CE serves as the Cost and Economics advisor for Army Study Advisory Groups. It chairs and oversees the Army Cost Review Board, develops and approves the Army Cost Position for all major acquisition programs, and conducts in-depth risk analyses of major Army programs and associated costs. DASA-CE also manages the Operating and Support Management Information System (OSMIS).

Navy/Marine Corps – Deputy Assistant Secretary of the Navy for Cost and Economics/Naval Center for Cost Analysis

The Naval Center for Cost Analysis (NCCA) advises the Secretary of the Navy, Chief of Naval Operations, and Commandant of the Marine Corps on cost and economic issues. NCCA leads the Department of the Navy cost community in issues of cost policy and policy implementation, with the goal of increasing the capability and efficiency of the Naval cost community. NCCA prepares ICEs for Department of the Navy MDAPs and MAIS programs, independently reviews MDAP program office estimates, and conducts economic analyses and special studies to support relevant defense issues. The Deputy Assistant Secretary of the Navy for Cost and Economics chairs the

DON Cost Review Board and approves all Component Cost Positions. NCCA coordinates all Department of the Navy cost research. NCCA also manages the Navy and Marine Corps Visibility and Management of Operating and Support Costs (VAMOSC) data systems. The Executive Director of NCCA is the Deputy Assistant Secretary of the Navy for Cost and Economics.

Air Force – Deputy Assistant Secretary of the Air Force for Cost and Economics/Air Force Cost Analysis Agency

The Air Force Cost Analysis Agency develops ICEs and non-advocate Component cost analyses of Air Force aircraft, space, weapons, command and control, and automated information systems to support acquisition, programming, and budgeting decisions. The Air Force agency also conducts non-advocate business case analyses, economic analyses, and special cost studies of major systems, force structure, and O&S costs supporting multiple Air Force and DoD stakeholders. It manages the Air Force Total Ownership Cost (AFTOC) data system, and develops annual aircraft cost per flying hour estimates to support planning, programming, and budgeting decisions. The Deputy Assistant Secretary of the Air Force for Cost and Economics develops the Air Force Cost Position for all major acquisition programs; conducts and coordinates cost research to develop analytical databases, methods, and tools; and advocates for and manages the Air Force cost analysis workforce ranging from tactical to headquarters levels.

Additional Field-Level Cost Organizations and Activities

There are several field-level cost organizations. These typically are located at a major product center such as the Naval Air Systems Command (NAVAIR) or the Air Force Space and Missile Center (SMC). This section provides a summary of these important organizations.

Army

TACOM Life Cycle Management Command

The TACOM Life Cycle Management Command (LCMC) Cost and Systems Analysis organization is responsible for preparation of program office estimates, life cycle cost estimates, economic analyses, and combat effectiveness modeling that support the development of combat and tactical vehicles. It manages the tools and databases to support cost and systems analysis processes for the TACOM LCMC. The major cost analysis activities are life cycle cost estimating, cost reporting and Earned Value Management (EVM), O&S cost baselines, support to Analyses of Alternatives (AoAs), source selection evaluations, and cost analyses associated with multi-year procurement contracts.

Aviation and Missile Command

The Aviation and Missile Command (AMCOM) Cost Analysis Division provides cost estimation and analysis support to Aviation, Missiles and Space Program Executive Offices and their Program/Project Offices. It manages the AMCOM Cost Analysis Program and develops, updates, or obtains cost estimating relationships, cost factors, and mathematical and computerized cost models for estimating purposes. It also develops cost estimates to support AoAs, tradeoff studies, and force structure cost estimates; develops and prepares life cycle cost estimates; and conducts other related studies in support of weapon system cost analyses. The Division performs cost risk

analyses and cost risk assessments to support weapon system program decisions. It also provides validation/review for cost estimates, economic analyses, and business case analyses.

Communication-Electronics Command

The Communication-Electronics Command (CECOM) Cost Analysis Division provides cost estimation and analysis support to CECOM Program Executive Offices and their Program/Project Offices. It provides several cost analysis services, including life cycle cost estimating, EVM, economic analysis, modeling and simulation, computer software and database support, and review and validation of business case analyses and other cost analyses.

Navy

Naval Air Systems Command

The Naval Air Systems Command (NAVAIR) Cost Department provides a wide variety of cost analysis products and services. Its primary focus is to provide a clear and comprehensive understanding of life cycle cost and attendant uncertainties to be used in developing, acquiring, and supporting affordable naval aviation systems. Besides life cycle cost estimates, the Cost Department provides source selection cost evaluation support, EVM analysis, cost research and databases, and various cost/benefit studies.

Naval Sea Systems Command

The Naval Sea Systems Command (NAVSEA) Cost Engineering and Industrial Analysis Division provides cost engineering and industrial base analysis for ships, ship-related combat systems, and weapons. It provides cost estimates in support of the Defense Acquisition Board (DAB) review process, including AoA studies. It also participates in contract proposal evaluations and the source selection process for builders and suppliers of ships and weapon systems, and it conducts analysis and forecasting of labor, industrial, and technical trends as they affect the overall acquisition of ships, combat systems, weapons, and other equipment.

Space and Naval Warfare Systems Command

The Space and Naval Warfare Systems Command (SPAWAR) Cost Estimating and Analysis Division may—depending on a program's acquisition category (ACAT)—provide assistance to ACAT I program offices, perform an ICE for ACAT II programs prior to a Milestone B or C review, or independently review a program office cost estimate upon the request of the Program Executive Officer (C4I and Space). The Division also provides more general cost analysis support to the Program Executive Officer (PEO) as needed.

Naval Surface Warfare Center

The Cost and Affordability Group resides within the Warfare Analysis Branch of the Requirements Analysis and Advanced Concepts Division of the Warfare Systems Department at the Naval Surface Warfare Center, Dahlgren Division. The Group produces cost estimates, cost-risk assessments, and affordability analyses for Combat Systems. The Group also develops cost-estimating methodology in support of systems development and production, AoAs, and strategic planning. Particular areas of expertise include model development and maintenance, cost-research databases, technology assessments, life cycle cost estimates, budget and force-level analyses,

performance-based cost models, product-oriented cost models, proposal evaluation, and source selection reviews.

Marine Corps Systems Command

The Cost and Analysis Branch (C&AB) is the Marine Corps Systems Command (MCSC) authority in the field of cost analysis. The C&AB conducts and oversees the development of cost estimates for MCSC weapon, information technology (IT), and non-standard training systems programs. The C&AB advises the Commander, MCSC and PEOs on the historic, current, and emerging trends in all elements of cost estimating and cost analysis. The Branch works for the MCSC Commander as an independent agent that provides cost products to Program Management Offices (PMOs) and PEOs. The Branch is organized into analytical teams in direct cost support of the PMOs and PEOs and a general support studies team for conducting AoAs and other operations research studies and analyses. Through its processes, the C&AB delivers life cycle cost estimates to satisfy the "Will-Cost" estimate, whereas PMOs perform the "Should-Cost" analysis.

Air Force

Air Force Life Cycle Management Center

In 2012, the Air Force combined cost estimating activities from three product centers under the Air Force Life Cycle Management Center (AFLCMC): the Aeronautical Systems Center, the Electronic Systems Center, and the Air Armament Center. AFLCMC leads estimates for program milestone decisions, manages the annual cost estimate process, supports pre-award activities and source selections, and participates in policy discussions resulting in high-quality cost estimates and analysis across the Center.

Air Force Space Command, Space and Missile Center

The SMC Cost Estimating Division supports cost estimates and cost analyses associated with Air Force Space Command and the SMC's mission of satellite acquisition, launch, and control.

Air Force Sustainment Center

The Air Force Sustainment Center (AFSC) Cost Estimating Division supports cost estimates and cost analyses associated with the AFSC's mission to provide depot maintenance, supply chain management and installation support to Air Force weapon systems.

Air Force Nuclear Weapons Center

The Air Force Nuclear Weapons Center (AFNWC) Cost Estimating Division supports cost estimates and cost analyses for all nuclear weapon systems activities. The responsibilities of the AFNWC include acquisition, modernization, and sustainment of nuclear system programs for both DoD and the Department of Energy.

Other

National Reconnaissance Office Cost Analysis Improvement Group

The National Reconnaissance Office (NRO) Cost Analysis Improvement Group provides independent cost estimating support to the NRO. This support covers milestone decisions, budget

submissions, EVM, *ad hoc* program support, data collection, methods development, and model/tool development.

Defense Information Systems Agency

The Defense Information Systems Agency (DISA) Analysis and Internal Controls Division guides, directs, and strengthens cost analyses within DISA; and prepares cost estimates for the development, procurement, and sustainment of automated information systems and IT capabilities. The Division provides independent support for DISA program/project costing efforts, and publishes DISA policies, practices and templates for cost estimation, cost/benefit analysis, and economic analysis.

Missile Defense Agency

The Missile Defense Agency (MDA) Director of Cost Estimating and Analysis (DOC) is responsible for ensuring the quality of cost estimates, providing direction on cost estimating processes, and working with the service cost organizations, CAPE, and the Government Accountability Office on all cost-related matters. In recent years MDA/DOC has worked closely with CAPE on preparing cost estimates for MDA programs and responding to congressional and Missile Defense Executive Board inquiries and tasks. In addition, the Agency has established a policy to collect CSDR data for its high-cost programs. For such programs, the CSDR plans are subject to approval by CAPE.

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Appendix B.

Major Defense Acquisition Program Unit Cost Reporting

Since 1982, the Congress has required DoD to track and report on the unit cost for most MDAPs. The requirement for unit cost reporting may be waived if the program has not entered Engineering and Manufacturing Development (EMD), a reasonable cost estimate has not been established for the program, and the system configuration is not well defined. The provisions of the law concerning unit cost reporting, commonly referred to as the Nunn-McCurdy provisions, are found in section 2433 of title 10, United States Code. A complete description of the Department's implementation of these provisions is provided in the *Defense Acquisition Guidebook* (see section 10.9 ("Acquisition Program Baseline") and section 10.10.1.5 ("Unit Cost Reports")).

There are two unit cost metrics subject to reporting, Program Acquisition Unit Cost (PAUC) and Average Procurement Unit Cost (APUC). PAUC is defined as the total program acquisition cost (sum of research, development, test, and evaluation; procurement; military construction; and acquisition-related Operations and Maintenance (O&M) appropriations) divided by the total program quantity of fully configured end items from both the EMD and Production and Deployment Phases. APUC is defined as the program procurement cost divided by the procurement quantity. Both unit cost metrics are tracked in constant dollars of a base year established for each program.

The most current cost estimate for each unit cost metric is tracked relative to two baseline cost estimates. The current baseline estimate refers to the most recent baseline approved by the Milestone Decision Authority (MDA). The original baseline estimate refers to the baseline approved at program initiation (usually Milestone B). A program is declared to have a unit cost breach when the most current unit cost estimate exceeds either baseline unit cost estimate by more than certain specified percentages. Specifically, as shown in Table B-1, a unit cost breach takes place when any of the following criteria are met, for either version of program unit cost (APUC or PAUC):

Table B-1. Unit Cost Breach Thresholds

	"Significant" Breach	"Critical" Breach
Current Baseline Estimate	+15%	+25%
Original Baseline Estimate	+30%	+50%

Note that there are two degrees associated with the severity of the unit cost breach. For significant unit cost breaches, the Department notifies the Congress of the breach within 45 days of the unit cost report and subsequently submits a program Selected Acquisition Report (SAR) with additional, breach-related information. For critical unit cost breaches, in addition to notifying the Congress and submitting the SAR, the Department is required to conduct a complete assessment of the program, led by USD(AT&L), and determine if it should be terminated or continued. The Department is required to terminate the program unless a letter signed by USD(AT&L), providing the certification that the program currently meets certain criteria established in law (section 2433a of title 10, United States Code), is submitted to the Congress

within 60 days of the SAR submission. Among other things, USD(AT&L) must certify that the Director, CAPE has determined the new unit cost estimates are reasonable. A complete description of the critical unit cost breach certification process can be found in the *Defense Acquisition Guidebook*, section 10.10.1.5.2.2 ("Critical Cost Breach Certification Requirements").

Appendix C.

Major Automated Information System Reporting

Public law (section 2445c of title 10, United States Code) requires annual and quarterly reports from MAIS programs, pre-MAIS (now referred to as unbaselined MAIS) programs, and any other investment in automated information system or IT products or services that is expected to exceed the MAIS thresholds. Details about the MAIS reporting requirements may be found in the *Defense Acquisition Guidebook,* section 10.11 ("Major Automated Information System Statutory Reporting"). Briefly, a MAIS Quarterly Report is used internally within the Department, and a MAIS Annual Report is provided to the congressional defense committees 45 days after submission of the President's Budget. The formats of the quarterly report and annual report are similar. The reports provide a program description, a summary of the program status, and the latest estimates regarding schedule, performance characteristics, acquisition cost, and life-cycle cost.

The reports compare the latest estimates of schedule, performance, and costs relative to the program baseline approved at the previous acquisition milestone. This comparison is used to determine if the program has a deviation known as either a significant change or a critical change. A significant change occurs when a program has a schedule delay of more than six months, but less than one year; there is a significant, adverse change in the expected performance of the system; or the estimated acquisition cost or life-cycle cost has increased by at least 15 percent but less than 25 percent. For a program with a significant change, the Department is required to notify the congressional defense committees of the change within 45 days after receiving the report that identified the deviation.

A critical change occurs when a program has a schedule delay of one year or more; there is a change in expected performance that will undermine the ability of the system to perform its intended functions; or the estimated acquisition cost or life-cycle cost has increased by 25 percent or more. For a program with a critical change, the Department must conduct an evaluation of the program, and then submit a report and a formal certification to the congressional defense committees within 60 days after receiving the report that identified the deviation; otherwise, appropriated funds may not be obligated for any major contract under the program until the certification is submitted. The certification must affirm the following:

(1) the program is essential to the national security or to the efficient management of DoD;
(2) there is no alternative to the program which will provide equal or greater capability at less cost;
(3) the new estimates of the costs, schedule, and performance parameters with respect to the program have been determined, with the concurrence of the Director, CAPE, to be reasonable; and
(4) the management structure for the program is adequate to manage and control program costs.

The statutory provisions pertaining to MAIS programs s are being removed from statute effective September 30, 2017. These provisions include the definition and dollar thresholds of MAIS programs, the MAIS reporting requirements, and the procedures for notifying the congressional defense committees of a significant change or critical change. This change was made by the National Defense Authorization Act for FY 2017. These changes will need to be incorporated into the various guidance documents described in Chapter II.

Appendix D.

CADE and Cost Data Collection Systems

Role of Cost Assessment Data Enterprise

As explained in Chapter IV, the Cost Assessment Data Enterprise (CADE) provides the users in the cost community with single-point access to the complete range of cost and related data. The CADE site map presented to the users is shown in Figure D-1.
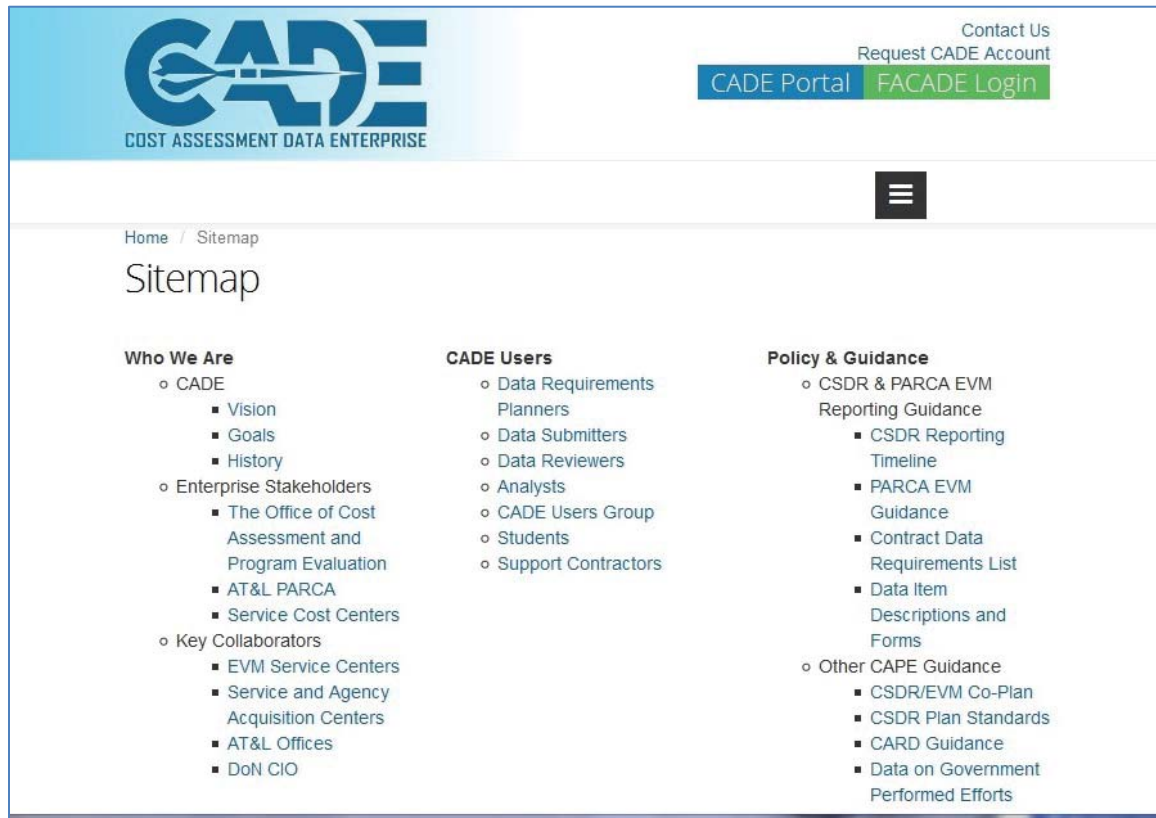
Figure D-1. CADE Sitemap

Note that the CADE web site not only provides access to the data, but also provides information about policy and procedures relevant to data reporting and collection. There is also access to a wide range of visual and analytic tools, and information about training opportunities concerning CADE, CSDR, and EVM. The specific data systems that are warehoused in CADE are described later in this appendix.

Access to CADE is made available to government analysts throughout the cost and acquisition communities. A display of active users throughout the Department is shown in Figure D-2. Note the size of each circle reflects the relative number of users. Also note that roughly 70 percent of the 1,870 CADE users reside in the military departments.
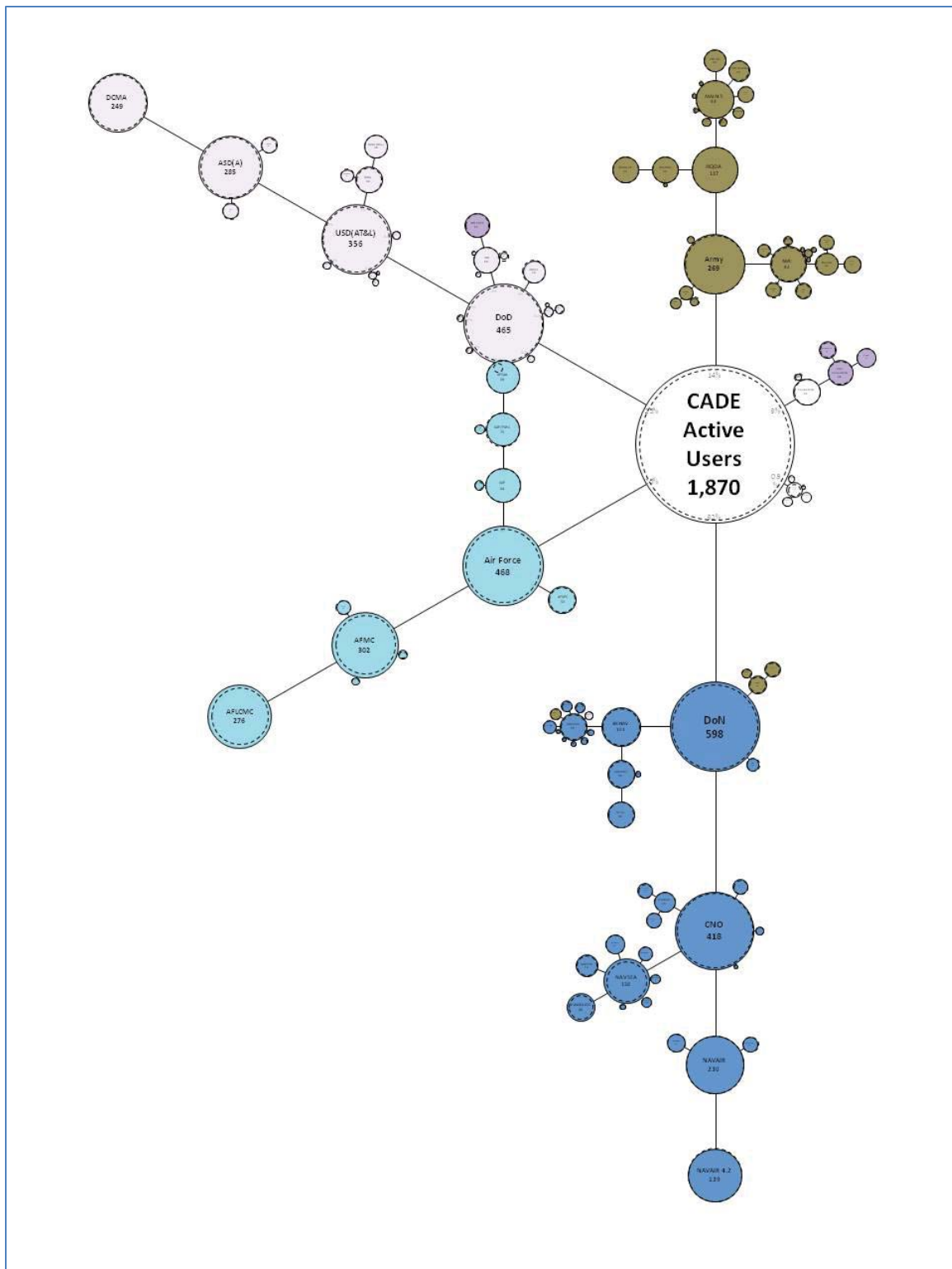
Figure D-2. CADE Users

Overview of Cost Data Reporting and Collection

Three primary data collection systems are used by DoD as the major sources of cost data for major acquisition programs:

- Cost and Software Data Reporting (CSDR) system
- Earned Value Management (EVM) Central Repository
- Visibility and Management of Operating and Support (VAMOSC) systems

Both the CSDR and EVM reporting use a common, product-oriented taxonomy known as a Work Breakdown Structure (WBS) that follows the guidelines of the DoD Standard Practice, *Work Breakdown Structures for Defense Materiel Items* (MIL-STD-881C). The WBS is a hierarchy of product-oriented elements (hardware, deliverable software, data, and services) that collectively constitute the system to be developed or produced. Further information about the use of the WBS in cost reporting and cost estimating can be found in the *Defense Acquisition Guidebook,* section 3.7.1.1 ("Work Breakdown Structure").

Cost and Software Data Reporting System

System Description

The CSDR system is the primary means that DoD uses to collect actual cost and related data on major defense contracts and subcontracts. Defense contractors provide information to support the CSDR system, under contractual agreements, by reporting data on development, production, and sustainment costs incurred in executing contracts. The two principal components of the CSDR are the contractor cost data reporting (CCDR) and software resources data reporting (SRDR) systems. These systems are hosted on a secure, web-based, information repository known as the Defense Automated Cost Information Management System within CADE.

CCDR is the primary means within DoD to systematically collect data on the development, production, and sustainment costs incurred by contractors. DoD Instruction 5000.02, *Operation of the Defense Acquisition System,* establishes the CCDR requirements for major contracts and subcontracts (regardless of contract type) associated with MDAPs and MAIS programs. These requirements may need to be changed due to new legislation concerning cost data collection made by the National Defense Authorization Act for FY 2017.

The SRDR system collects software cost metrics data to supplement the CCDR cost data, to provide a better understanding and improved estimating of software-intensive programs. DoD Instruction 5000.02 establishes SRDR requirements for major contracts and subcontracts (regardless of contract type) associated with MDAPs and MAIS programs. Data collected from applicable contracts include type and size of the software application(s), schedule, and labor resources needed for the software development. Efforts to improve SRDR reporting are described in Chapter IV.

The CSDR data that is currently collected is illustrated in Figure D-3. Access to CSDR data is provided within CADE to authorized users. Detailed procedures and other implementation

guidance for both CSDR systems are found in DoD 5000.04-M-1, *Cost and Software Data Reporting (CSDR) Manual*. This Manual is now being updated as described in Chapter IV.
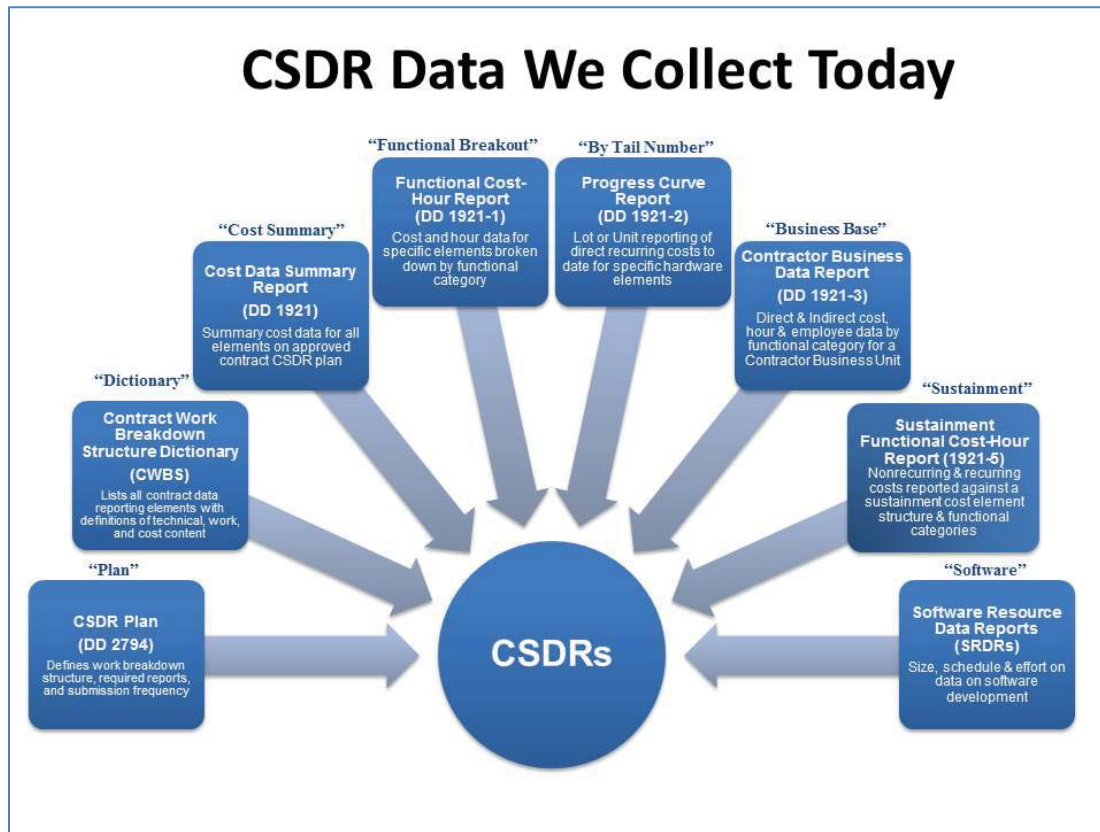
Figure D-3. CSDR Data Reports and Plans

The CSDRs provide essential cost information based on actual cost experience not found in other data sources. The reports provide labor hours, material dollars, and overhead dollars by WBS element and cost estimating functional category. The data may also be used to investigate fixed-variable direct and indirect cost behavior, and to segregate nonrecurring and recurring costs. The data from these reports can be used to construct learning curve projections for labor hours and other recurring costs at various levels of the WBS. The timing of the periodic data reporting is structured to provide key support to the preparation of cost estimates at milestone and other acquisition reviews.

The Defense Cost and Resource Center (DCARC) provides extensive support to the CSDR users and data providers. The DCARC hosts semiannual CSDR Focus Group meetings that provide a forum for DoD and industry stakeholders to discuss evolving CSDR policies and processes, and raise any issues or concerns. The Center provides on-site training to users and data providers at various locations several times each year. This training addresses CSDR policies, CSDR plan construction and subsequent reporting requirements, and DCARC IT systems and applications.

Cost and Software Data Reporting Compliance

The DCARC continually monitors each MDAP for compliance with CSDR requirements where applicable. CSDR reporting is not required when (1) the program is in pre-Milestone A status, with no prototypes, or (2) the CSDR requirements have been waived by CAPE. Waivers for CSDR requirements may be granted when (1) the relevant item being procured is truly a commercial item, or (2) an item is purchased under competitively awarded, firm fixed-price contracts, as long as competitive conditions continue to exist.

The most recent CSDR compliance rating criteria for programs are provided in **Figure D-4** below.

CSDR Compliance Rating Criteria
Implementation in January 2017

RATING	CRITERIA
Green	No open CSDR compliance issues.
Green Advisory	Outstanding CSDR deliverable less than or equal to three months overdue.
Yellow	Outstanding CSDR deliverable greater than three months, but less than or equal to six months overdue.
Red	1. Outstanding CSDR deliverable greater than six months overdue. 2. Formally rejected CSDR deliverable outstanding greater than 30 days overdue. (New)
Red-Critical	1. Program Office released Request for Proposal (RFP) without approved CSDR plan. 2. Program Office awarded prime contract without approved CSDR plan or failed to mod contract to place an approved CSDR plan on contract. 3. Program Office or Prime contractor failed to enforce flow down of CSDR requirements to direct reporting subcontractor or the prime contractor failed to mod subcontract to place an approved CSDR plan on contract. 4. Three or more consecutive formal rejections for the same CSDR deliverable event will remain red-critical until the deliverable is accepted. (New) 5. Outstanding CSDR deliverable greater than 12 months overdue. (New)
Not Rated	The program has no CSDR activity (e.g., approved waiver, Pre-MDAP, cancelled, has no CSDR activity, or not currently tracked)

Figure D-4. CSDR Compliance Rating Criteria

Figure D-5 provides a breakdown of CSDR compliance by fiscal quarter using the compliance ratings in effect at the time for all MDAPs since FY 2012. Note that the compliance ratings were revised late FY 2014, and will be revised again effective in the second quarter of FY 2017.
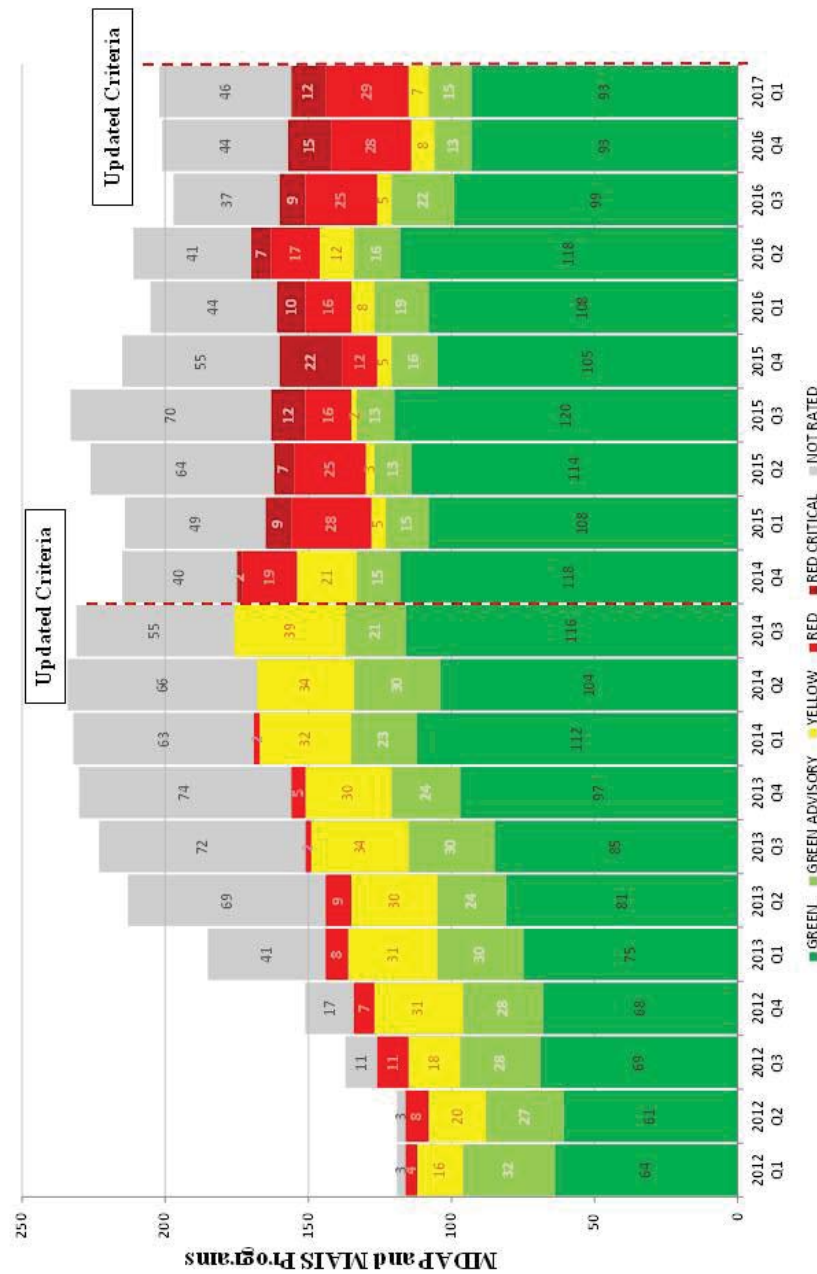
Figure D-5. Quarterly CSDR Compliance History by Fiscal Year

At the end of the first quarter of FY 2017, 69 percent of the programs receiving a rating were rated as green or green advisory, 5 percent were rated as yellow, 18 percent were rated as red, and 8 percent were rated as red critical. CAPE and the DCARC continue to emphasize CSDR reporting compliance in order to achieve more accurate and timely cost data to support program cost estimates. Specifically, in cases in which required cost data are not being reported in a timely fashion (i.e., are more than six months late), CAPE now insists that the data be provided before it can complete its ICE, or concur with a military department cost estimate.

Earned Value Management Central Repository

In support of the USD(AT&L) staff, the DCARC hosts the EVM Central Repository within CADE. The central repository supports the centralized reporting, collection, archiving, and distribution of key EVM data reports (such as Integrated Program Management Reports) for MDAPs and MAIS programs. General information about EVM reporting is available in the *Defense Acquisition Guideboo*k, section 11.3.1 ("Earned Value Management"), and on the DoD EVM website at http://www.acq.osd.mil/evm.

The central repository supports complete, timely, and secure transfer of electronic data from the contractor to the repository; secure and controlled warehousing of the data; and controlled, timely, and secure access to the data by authorized users. The main purpose of these data is to provide a consistent and timely situational awareness of acquisition execution.

Visibility and Management of Operating and Support Costs Data System

DoD requires that each military department maintain a system that collects historical data on the O&S costs for major fielded weapon systems. The CAPE Deputy Director for Cost Assessment provides policy guidance on this requirement, known as the VAMOSC program; specifies the common format in which the data are to be reported; and monitors its implementation by each of the military departments. The National Defense Authorization Act for FY 2012, Public Law 112-81, contains a provision ("Assessment, Management and Control of O&S Costs") that resulted in strengthened CAPE oversight of the VAMOSC program.

Each department has its own unique VAMOSC data system that tracks actual O&S cost experience for major weapon systems. The data can be displayed by timeframe, at various levels of detail, and by functional elements of cost (such as depot maintenance, fuel, consumable items, and so forth). Each VAMOSC system provides not only cost data, but related non-cost data (such as system quantities and operating tempo) as well. VAMOSC data can be used to analyze trends in O&S cost experience for each major system, as well as to identify and assess major cost drivers. VAMOSC data systems are managed by each military department as follows:

- The Navy's VAMOSC management information systems (known as Navy VAMOSC and Marine Corps VAMOSC) collect and report US Navy and US Marine Corps historical weapon system O&S costs. Both systems are managed by NCCA. The current status of efforts to improve the Navy and Marine Corps systems are described in Chapter IV.

- The Army's VAMOSC system, called the Operating and Support Management Information System (OSMIS), tracks O&S cost data and other information for over 1,400 major Army weapon/materiel systems and is maintained by DASA-CE. OSMIS-tracked systems include

combat vehicles, tactical vehicles, artillery systems, aircraft, electronic systems, and miscellaneous engineering systems. OSMIS will be significantly improved in the future when it is fed data from the emerging Army Enterprise Resource Planning programs, including the General Fund Enterprise Business System.

- The Air Force's VAMOSC system, AFTOC, is managed by the Deputy Assistant Secretary of the Air Force for Cost and Economics. It provides O&S cost data and related information on all Air Force aircraft, space systems, and missiles.

Abbreviations

ACAT	Acquisition Category
ACV	Amphibious Combat Vehicle
AFIT	Air Force Institute of Technology
AFLCMC	Air Force Life Cycle Management Center
AFNWC	Air Force Nuclear Weapons Center
AFSC	Air Force Sustainment Center
AFTOC	Air Force Total Ownership Cost
AMCOM	Aviation and Missile Command
AoA	Analysis of Alternatives
AOC-WS Inc 10.2	Air and Space Operations Center – Weapon System Increment 10.2
APUC	Average Procurement Unit Cost
B-2 DMS-M	B-2 Defensive Management System - Modernization
C&AB	Cost and Analysis Branch
CADE	Cost Assessment Data Enterprise
CAPE	Cost Assessment and Program Evaluation
CARD	Cost Analysis Requirements Description
CCDR	Contractor Cost Data Reporting
CCP	Component Cost Position
CECOM	Communication-Electronics Command
CSDR	Cost and Software Data Reporting
DAB	Defense Acquisition Board
DASA-CE	Deputy Assistant Secretary of the Army for Cost and Economics
DAU	Defense Acquisition University
DCARC	Defense Cost and Resource Center
DISA	Defense Information Systems Agency
DOC	Director of Cost Estimating and Analysis
DoD	Department of Defense
DoDCAS	Department of Defense Cost Analysis Symposium
EMD	Engineering and Manufacturing Development
EPAWSS	Eagle Passive Active Warning Survivability System
EVM	Earned Value Management
FCoM	Full Cost of Manpower

FMS	Foreign Military Sales
FY	Fiscal Year
FYDP	Future Years Defense Program
GBSD	Ground Based Strategic Deterrent
GPS OCX	Global Positioning System Next Generation Operational Control System
ICE	Independent Cost Estimate
ITEP	Improved Engine Turbine Program
JMS Inc 2	Joint Space Operations Center (JSpOC) Mission System Increment 2
JPALS	Joint Precision Approach and Landing System
JSTARS Recap	Joint Surveillance Target Aircraft Radar System Recapitalization
LCMC	Life Cycle Management Command
MAIS	Major Automated Information System
MCA	Master's Degree Program in Cost Analysis
MCEA	Master's Degree Program in Cost Estimating and Analysis
MCSC	Marine Corps Systems Command
MDA	Milestone Decision Authority
MDA	Missile Defense Agency
MDAP	Major Defense Acquisition Program
MNVR	Mid-Tier Networking Vehicular Radio
MYP	Multi-Year Procurement
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NCCA	Naval Center for Cost Analysis
NGJ Inc 1	Next Generation Jammer Increment 1
NRO	National Reconnaissance Office
O&M	Operations and Maintenance
O&S	Operating and Support
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OSMIS	Operating and Support Management Information System
PAR	Presidential Aircraft Recapitalization
PAUC	Program Acquisition Unit Cost
PEO	Program Executive Officer
PMO	Program Management Office

POM	Program Objective Memorandum
RFP	Request for Proposal
SAR	Selected Acquisition Report
SCP	Service Cost Position
SMC	Space and Missile Center
SPAWAR	Space and Naval Warfare Systems Command
SRDR	Software Resources Data Reporting
USD(AT&L)	Under Secretary of Defense (Acquisition, Technology and Logistics)
USD(P&R)	Under Secretary of Defense (Personnel and Readiness)
VAMOSC	Visibility and Management of Operating and Support Costs
WBS	Work Breakdown Structure
WSARA	Weapon Systems Acquisition Reform Act of 2009

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